November
1960

# COMMERCIAL FERTILIZER

## and PLANT FOOD INDUSTRY

# *sleek...*
# *trim...*
# *and perfectly coordinated!*

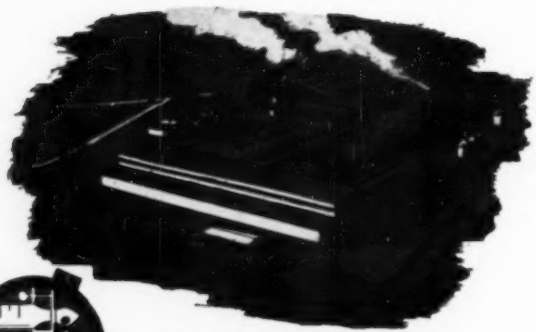
**That's our new 300,000 sq. ft. multiwall bag plant at St. Marys, Ga.**

Like the building itself, our equipment is new and the very latest in mechanical efficiency.

This fully integrated plant has every facility for turning out every kind of multiwall bag ... open mouth or valve, sewn or pasted, stepped-end, and our own patented Kraft-lok® valve; also bags with special inserts, sleeves, protective linings or outers, and vapor barriers.

The best in multiwall bags—are Kraft Bags!

*... and the best in open mouth bag filling machines is The Kraftpacker, for which we are exclusive sales agents.*



Paper Mill at St. Marys, Ga.

**KRAFT BAG CORPORATION**
Gilman Paper Company Subsidiary
**630 Fifth Avenue, New York 20, N. Y.**
**Daily News Building, Chicago 6, Ill.**

☐ We would like to know more about Kraft Bag Multiwalls.
☐ We would like to know more about The Kraftpacker.

COMPANY NAME_____
ADDRESS_____
CITY_____ ZONE____ STATE_____
PRINCIPAL_____
PRODUCT MFD_____

C.F

# NO BLACK MAGIC NEEDED IF WEATHERLY DESIGNED AND EQUIPPED YOUR CONTROLLED GRANULATION PLANT

Some push-button plants demand a Master Engineer, Senior Grade to run them. But not Weatherly Controlled Granulation plants. Several dozen, running now, demonstrate this.

These are being run by average human beings, many of whom never saw a fertilizer plant before. We trained them. It did not take long because Weatherly controls are so simple any normal mind can understand their use quickly.

It is basic Weatherly policy that, before we hand you the key, your plant is running smoothly, up to capacity, producing uniform granules—through 6 and on 16 mesh . . . and that your people know, beyond the shadow of a doubt, how to run them.

Weatherly plants go up on schedule. They run against pressure because they are designed and built to do it. They go on designed capacity right away—and they stay on it.

You make better profit, with less trouble, fewer problems . . . and our plants now operating prove it. Let's talk it over—that doesn't cost anything!


OUR PLANTS PURR LIKE KITTENS

## The D. M. WEATHERLY COMPANY

*Industrial Engineers and Builders*

80 Eleventh St., N.E., Atlanta, Georgia Phone: TRinity 5-7986

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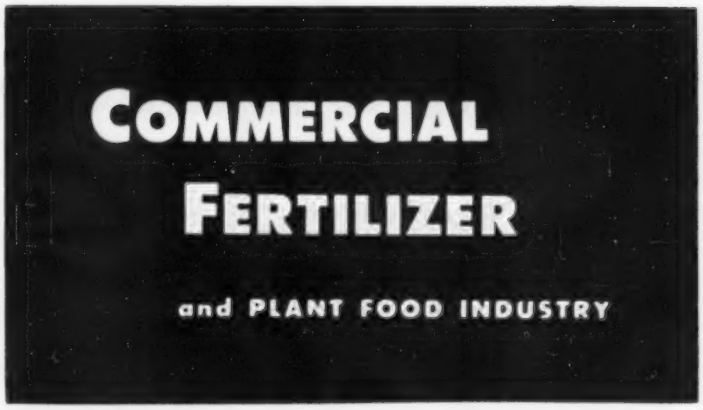


Vol. 101, No. 5 November, 1960

**Established 1910**

# COMMENTING FREELY

by

**Bruce Moran**

**Two quotes that team up to tell their own story:**

**From "Fertilizer News", issued by The Fertilizer Association of India:**

"In the long struggle to master the world around us and to turn it to our advantage, mankind has known many triumphs. We can travel across every part of the world in a day or two. We can transmit our thoughts in a second. We have conquered diseases which took heavy toll before. But the most basic triumph still eludes us. We still have not conquered the hunger which continues to cast its shadow over the lives of millions of people in the poorer regions of the world."

**From an advertising agency* advertisement for itself: "Can your advertising agency grow 100-bushel corn?"**

**Our own "freely" comment: Can the president of your fertilizer company grow 100 bushel corn? Does he own a farm? Does he work it? Does he learn anything from it which can be applied to making yours a better fertilizer operation?**

**Or are you still hoeing the same old row? Think it over.**

* Marsteller, Rickard, Gebhardt and Reed, Inc.

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### regular departments



### features



### meetings



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# TROUBLE-SHOOTING


IMC Technical Service solves fertilizer industry problems in the office... in the plant... in the lab... in the field.

From the files of IMC's Technical Service comes this case history that illustrates the range of IMC's concept of technical service — creative technical assistance that begins at the ground and continues through every phase of production.

From disaster, a sheaf of marketing, labor and manufacturing data emerges to guide IMC planners and local plant officials in reconstructing facilities to match potential.

# your toughest problems

## *IMC tech service reps are trained, equipped, dedicated to solving hundreds of manufacturing problems each year. They're men on-the-go, interested in serving you better!*

Your IMC tech service man knows what an inaccurate meter calibration can cost you . . . he knows and understands the importance of peak production throughout the rush season — and that a plant shutdown of only a few hours can cut heavily into your year's profit. He is a fertilizer man by experience and training. He has the know-how to pitch in and help — not only in the problems that occur, but also in seeking out and preventing trouble before it happens. Here's how IMC tech service has helped just a few customers:

**Ontario** — Subject company was starting up a new plant. IMC's Johnson and Franklin assisted in the original installation of equipment. The plant was put on stream and the customer went into immediate continuous production using IMC's formulations.

**Florida** — Subject company requested help in the granulation of X-O-X grades using Sul-Po-Mag. Mr. Causey was dispatched to assist in the proper production of this product.

**Arkansas** — Subject company was almost completely destroyed by fire. On Monday, IMC Technical Service was requested to assist in engineering and rebuilding the plant. On Friday, Mr. Robert Heck presented the customer with completed preliminary layouts.

**Iowa** — Subject company requested immediate engineering assistance for construction of a second shipping mill including simultaneous operation of bagging fertilizer and loading bulk trucks. IMC's De Long, with the assistance of IMC engineering, prepared completed drawings for this installation in one week's time.

Use the extra knowledge, the new ideas, the cost-cutting techniques which IMC can bring to bear. Your IMC technical service man concentrates on total service. Can he help you?

### Now—Technical Training Offered to IMC Customers

Due to repeated requests from our customers, IMC has initiated a program on some of the most troublesome technical problems confronting fertilizer manufacturers.

Formulation, mechanization, maintenance and trouble-shooting are all part of this practical meeting agenda. Day-to-day problems and their solutions are currently being discussed in 11 cities throughout the country.

Plan to attend the IMC Technical Training Meetings — one of which will be close to your city. Check below for times and places.

| CITY | DATE |
|---|---|
| Minneapolis, Minn. | Monday, Tuesday, October 24, 25 |
| Indianapolis, Ind. | Wednesday, Thursday, October 26, 27 |
| Baltimore, Md. | Wednesday, Thursday, November 9, 10 |
| New York, N.Y. | Monday, Tuesday, November 14, 15 |
| Raleigh, N.C. | Wednesday, Thursday, November 16, 17 |
| Toledo, O. | Monday, Tuesday, November 21, 22 |
| Winter Park, Fla. | Monday, Tuesday, November 28, 29 |
| Montgomery, Ala. | Wednesday, Thursday, November 30, December 1 |
| Kansas City, Mo. | Monday, Tuesday, December 5, 6 |
| Tyler, Tex. | Monday, Tuesday, December 12, 13 |
| Jackson, Miss. | Wednesday, Thursday, December 14, 15 |

AGRICULTURAL CHEMICALS DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

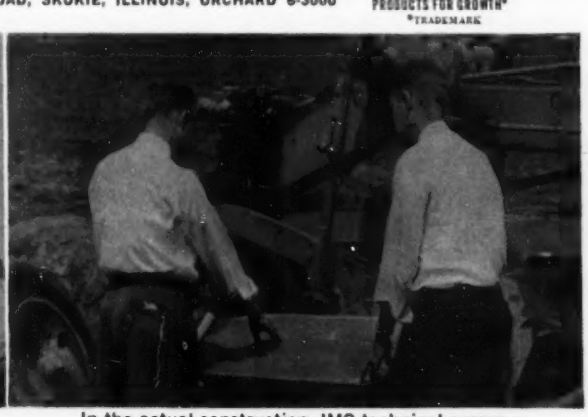
ADMINISTRATIVE CENTER, OLD ORCHARD ROAD, SKOKIE, ILLINOIS, ORCHARD 6-3000

IMC

PRODUCTS FOR GROWTH*

*TRADEMARK

Translated into preliminary designs, this data is creatively interpreted into smooth-running production methods by IMC experience and made consistent with available building budgets.

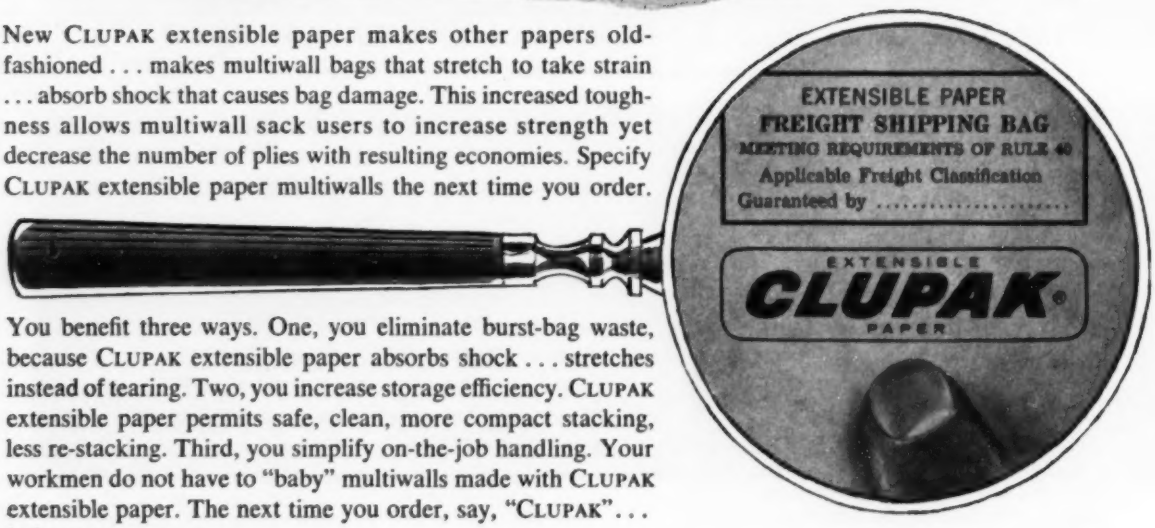


In the actual construction, IMC technical personnel are "on site" to further extend technical aid, interpret intricate installations and define production and architectural ideas.

FO-3-01

# ELEMENTARY...IT'S A EXTENSIBLE CLUPAK® PAPER* MULTIWALL BAG ...THAT'S WHY IT DIDN'T BREAK!


New CLUPAK extensible paper makes other papers old-fashioned . . . makes multiwall bags that stretch to take strain . . . absorb shock that causes bag damage. This increased toughness allows multiwall sack users to increase strength yet decrease the number of plies with resulting economies. Specify CLUPAK extensible paper multiwalls the next time you order.



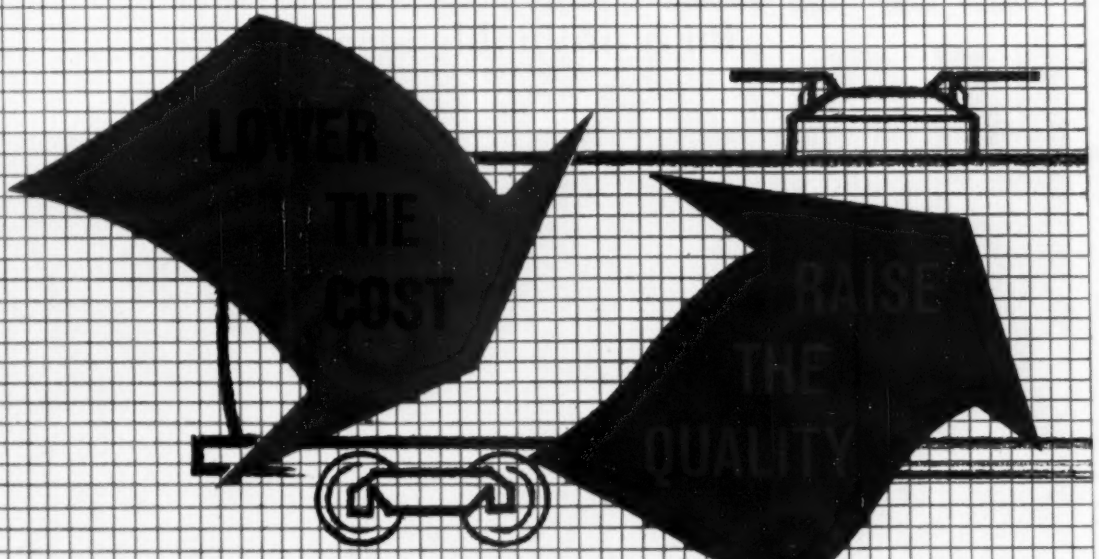

You benefit three ways. One, you eliminate burst-bag waste, because CLUPAK extensible paper absorbs shock . . . stretches instead of tearing. Two, you increase storage efficiency. CLUPAK extensible paper permits safe, clean, more compact stacking, less re-stacking. Third, you simplify on-the-job handling. Your workmen do not have to "baby" multiwalls made with CLUPAK extensible paper. The next time you order, say, "CLUPAK"... before you say paper.

*Clupak, Inc.'s trademark for extensible paper manufactured under its authority and satisfying its specifications. Clupak, Inc., 530 5th Ave., N. Y. 36, N. Y.

# DRI-SOL

## ADVANCED, NEW NITROGEN SOLUTIONS

**developed by Commercial Solvents Corporation**




## OF YOUR MIXED FERTILIZERS

It's a pleasure to tell you about the new, exclusive (patents pending) DRI-SOL Nitrogen Solutions. This new line represents a significant advancement in ammoniating solutions. In making mixed fertilizers, you will find the performance of these solutions quite impressive. You can count on at least 7 distinct benefits:

1. Reduced shipping costs. 2. Better process control in continuous ammoniation. 3. Lower formulation costs. 4. Lower drying costs, increased dryer capacity, or a drier product. 5. Increased plant capacity. 6. Faster curing and quicker shipment. 7. Improved quality of both conventional and granular fertilizer.

In addition to these 7 advantages, you may find still other ways in which these unique DRI-SOL solutions can be useful to you. For example, these solutions can be used to help offset the high water content of low strength acid, or to produce those grades which are difficult or impossible to make with conventional solutions.

CSC's DRI-SOL Nitrogen Solutions are available in grades ranging from 24% ammonia and 76% ammonium nitrate to equal parts by weight of ammonia and ammonium nitrate. This new line of solutions is essentially anhydrous. Water content: about 0.5%.

DRI-SOL solutions are generally available in the Southern and Midwestern States. Technical literature available to fertilizer manufacturers.

AGRICULTURAL CHEMICALS DEPARTMENT

**COMMERCIAL SOLVENTS CORPORATION** CSC

260 Madison Avenue, New York 16, N. Y.

★Please send me technical data on CSC's new DRI-SOL Nitrogen Solutions. The solutions numbers I am currently using are:_____

The bulk of my mixed goods tonnage is made up in the following grades:_____, _____, _____

NAME_____

TITLE_____

COMPANY_____

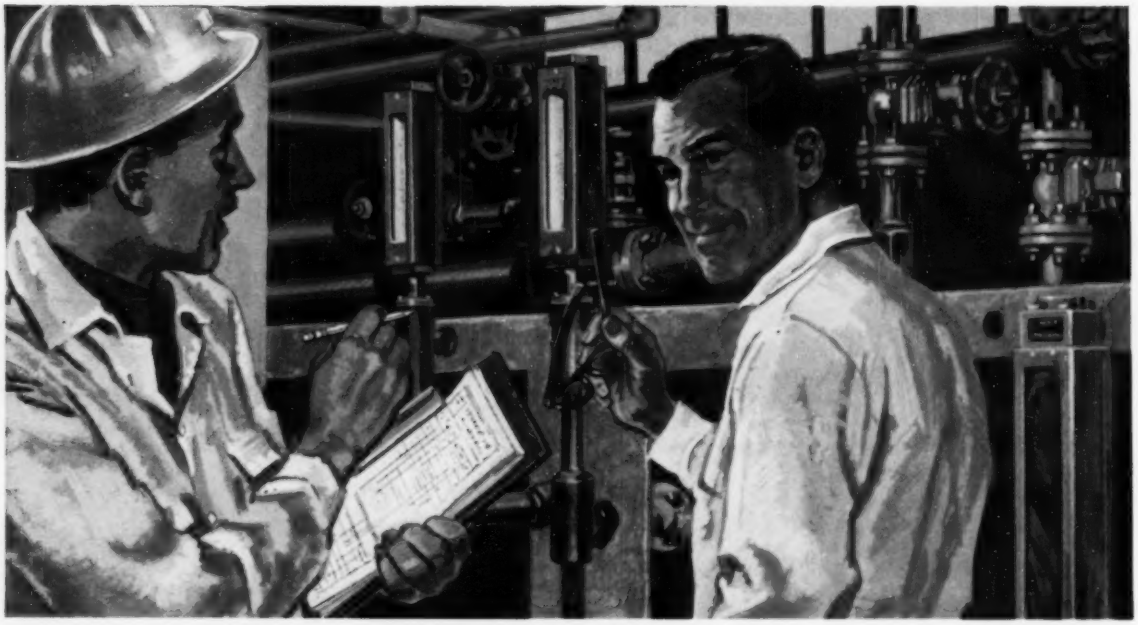
STREET_____

CITY_____ ZONE_____

STATE_____

*If you have a fertilizer formulation or production problem . . .*

# Depend on your Phillips *66* Technical Service Man for a profitable answer



Experienced Phillips *66* Technical Service Men travel thousands of miles each year to help fertilizer manufacturers net a greater profit return. They work with you—"at your plant"—to help solve production problems, lower material costs, work out more profitable formulations and improve operating efficiency.

The training and know-how of Phillips *66* Technical Service Men—backed by the famous Phillips *66* Electronic Computer Service for working out cost-cutting formulations—has helped many fertilizer manufacturers save hundreds and even thousands of dollars a year.

Phillips *66* Technical Services are immediately available to help you solve formulation and production problems. And remember, Phillips has ready supplies of high quality Nitrogen Solutions, Anhydrous Ammonia, Ammonium Nitrate, Ammonium Sulfate, and Triple Superphosphate.

**PHILLIPS PETROLEUM COMPANY,** *Bartlesville, Oklahoma*

PHILLIPS 66

**SALES OFFICES:**

AMARILLO, TEX.—*First Nat'l Bank Bldg.*
ATLANTA, GA.—*1428 West Peachtree Street, Station "C" P. O. Box 7313*
BARTLESVILLE, OKLA.—*Adams Building*
CHICAGO, ILL.—*7 South Dearborn St.*
COLUMBUS, OHIO—*395 E. Broad St.*
DENVER, COLO.—*1375 Kearney St.*
DES MOINES, IOWA—*6th Floor, Hubbell Bldg.*
HOUSTON, TEX.—*6910 Fannin Street*
INDIANAPOLIS, IND.—*3839 Meadows Drive*
KANSAS CITY, MO.—*201 E. Armour Blvd.*
MAPLEWOOD, N. J.—*2075 Millburn Ave.*
MINNEAPOLIS, MINN.—*215 South 11th St.*
OMAHA, NEB.—*3212 Dodge St.*
PASADENA, CALIF.—*317 N. Lake Ave.*
RALEIGH, N. C.—*401 Oberlin Road*
SALT LAKE CITY, UTAH—*68 South Main*
SPOKANE, WASH.—*521 E. Sprague*
ST. LOUIS, MO.—*4251 Lindell Blvd.*
TAMPA, FLA.—*3737 Neptune St.*
TULSA, OKLA.—*1708 Utica Square*
WICHITA, KAN.—*501 KFH Building*

*last year over 125 firms received greater merchandising impact from their multiwalls thru UNION-CAMP'S*

# BAG DESIGN


## *another FREE service of the ★ Star Packaging Efficiency Plan!*

Over 125 multiwall users last year cashed in on the bag design feature of the 5-Star Packaging Efficiency Plan. In some cases UNION-CAMP artists came up with striking new bag designs which contributed to increased sales. In others they created a family of high-recognition designs for a complete product line. In still others they developed simplified, faster-reading identification prints —resulting in thousands of dollars worth of savings.

Through the 5-Star Plan, UNION-CAMP artists and designers may help you achieve greater merchandising impact from your multiwalls. Their services are free.

Besides bag design this comprehensive packaging service offers you major money-saving improvements in bag construction, specifications control, packaging machinery and materials handling.

See your local UNION-CAMP man for details.

UNION-CAMP®
MULTIWALL BAGS
Union Bag-Camp Paper Corporation · 233 Broadway N.Y. 7, N.Y.

★ BAG DESIGN · BAG CONSTRUCTION · SPECIFICATIONS CONTROL · PACKAGING MACHINERY · PLANT SURVEY


ELECTION TIME leaves many folks very happy, others simply resigned. In any event it leaves most ready to settle down to normal business thinking again. And it is high time.

THE PRESIDENT-ELECT has until January to decide what actions he will take on a number of pressing matters which the campaign has emphasized. But you can be sure that none of them will rock the boat in the somewhat delicate and sensitive circumstances... both within and without the USA...which face him.

DEPRESSION TALK will subside because depression is virtually an impossibility these days, and business men recognize the fact. The general public will take a little longer to recognize that good old hard work will keep the willing doing all right in the long run.

WE'LL BE OK, THANKS.

Yours faithfully,

Vernon Mount


# "This new CHASE POLY-PLY multiwall bag is a real Problem Solver"

*Says Lee Schram, Multiwall Bag Buyer, Morton Salt Company*

The Morton Salt Company needed a new and better bag for its salt shipments—a moisture-resistant bag that would be easier to handle and ship, more flexible at low temperatures, highly resistant to abrasion and rupture, yet economical in cost.

To solve this problem, Chase developed the Poly-Ply Multiwall Bag featuring an entirely new construction. It combines—for the first time—the advantages of a ply of light-weight sheet polyethylene and heavy-duty multiwall paper. It provides excellent moisture protection...extra strength...new ease of handling...flexibility even at temperatures way below zero. After six months testing under commercial conditions Morton officials report highly satisfactory results!

If you package moisture-sensitive products—such as sugar, chemicals or fertilizers—this new bag can be a problem solver for you, too. It is now available in 25-, 50- and 100-pound sizes. Call your Chase representative for full information.

**New and Unique Construction: separate, intermediate ply of sheet polyethylene, shielded by heavy-duty kraft paper inside and out, assures effective moisture protection, strength and easy handling advantages.**

**CHASE BAG COMPANY**

355 Lexington Avenue • New York 17, N.Y. • 32 plants and sales offices coast to coast


# Another big load coming your way?

Only *Burlap* can handle it for you. You save on space, because burlap bags stack higher. You save on waste... burlap keeps breakage down. You save on handling costs... only burlap can take on 200-pound loads. You save on the bags themselves... burlap is re-usable. And another big plus... the farmer likes burlap. *He* asks for it. You should too.

**THE BURLAP COUNCIL** • 122 East 42nd Street, New York 17


*Fleet connection to your plant . . .*

# SOHIO / hub of the highballers

## Center of 5 rail systems puts Sohio products plant-side fast . . . dependable, low cost, convenient

Sohio's fleet of modern tank cars highball down a network of 5 different rail lines . . . write a super-speed delivery story in every corner of Sohioland. This strategic location and up-to-the-minute equipment make Sohio a specialist in quick-time delivery of nitrogen products.

Sohio's tank car specifications are tailored to meet your specific requirements. Top and bottom unloading aluminum and steel cars provide aqua ammonia service . . . special aluminum cars with spring-loaded safety valves handle nitrogen solutions. Sohio cars carry the latest safety devices . . . and Sohio-trained personnel inspect and maintain the tank cars to assure top mechanical condition and quality control every mile of the way. Important too, Sohio is alert to the development of new equipment that means further improvement in Sohio service.

Or if you take delivery by truck, Sohio's fleet rolls on call, arrives on time . . . trucks are self-unloaded and the Sohio trained driver can handle the hook-up and unloading alone.

**See the man from Sohio first for high quality anhydrous ammonia — aqua ammonia — coated 45% or uncoated 46% urea — 18 nitrogen solutions, including all urea types.**

*. . . we're serious about SERVICE at Sohio*

**SOHIO CHEMICAL COMPANY**

**Agent for Solar Nitrogen Chemicals, Inc.**

**Fort Amanda Rd., P.O. Box 628 • Lima, Ohio**

**Phone CApitol 5-8015 or wire (TWX call letters LIMA O 497-U)**

# Borate your Fertilizers...

# adding boron boosts profits!

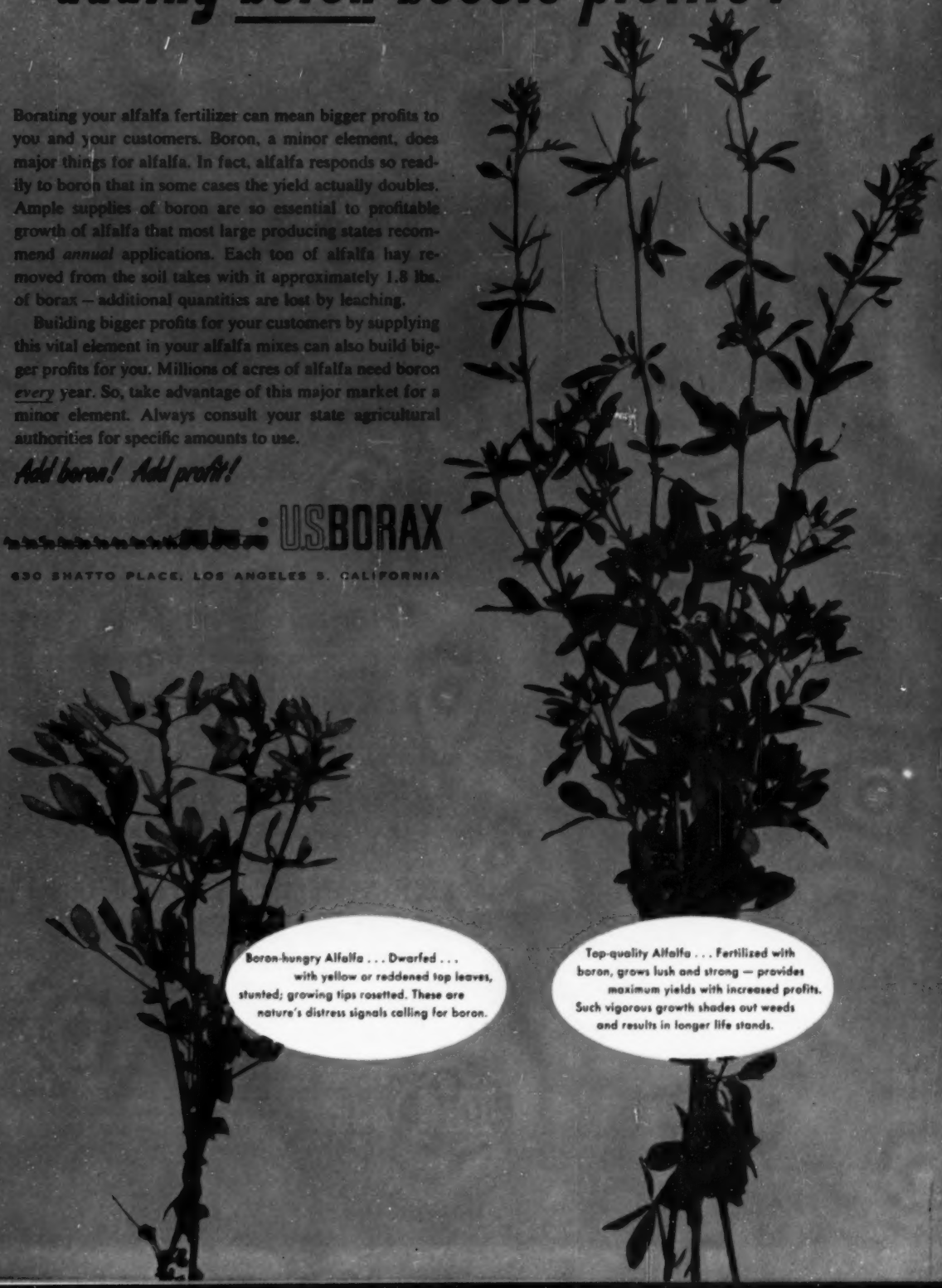
Borating your alfalfa fertilizer can mean bigger profits to you and your customers. Boron, a minor element, does major things for alfalfa. In fact, alfalfa responds so readily to boron that in some cases the yield actually doubles. Ample supplies of boron are so essential to profitable growth of alfalfa that most large producing states recommend *annual* applications. Each ton of alfalfa hay removed from the soil takes with it approximately 1.8 lbs. of borax — additional quantities are lost by leaching.

Building bigger profits for your customers by supplying this vital element in your alfalfa mixes can also build bigger profits for you. Millions of acres of alfalfa need boron *every* year. So, take advantage of this major market for a minor element. Always consult your state agricultural authorities for specific amounts to use.

*Add boron! Add profit!*

U.S. BORAX

630 SHATTO PLACE, LOS ANGELES 5, CALIFORNIA



Boron-hungry Alfalfa . . . Dwarfed . . . with yellow or reddened top leaves, stunted; growing tips rosetted. These are nature's distress signals calling for boron.

Top-quality Alfalfa . . . Fertilized with boron, grows lush and strong — provides maximum yields with increased profits. Such vigorous growth shades out weeds and results in longer life stands.

# HIS BUSINESS IS MAKING YOUR BUSINESS BETTER

*Like all the men and women in Cyanamid's phosphate operation, his only business is phosphates for your mixed fertilizers*

He's one of several hundred Cyanamid people who mine, process, research, deliver and service phosphatic materials for your acidulation and mixed fertilizer business. These people put Cyanamid's more than 40 years of phosphate experience into products and services you can use.

**Services you can use**

*Traffic Service:* Cyanamid traffic specialists are ready to route and ship your orders without delays. Their knowledge can save you money and can make your operation run even more efficiently.

*Technical Service:* Cyanamid's staff of technical experts are on 24-hour alert. Often, what are new problems to you are solved problems to them. Make your formulation and production problems theirs. That's their job.

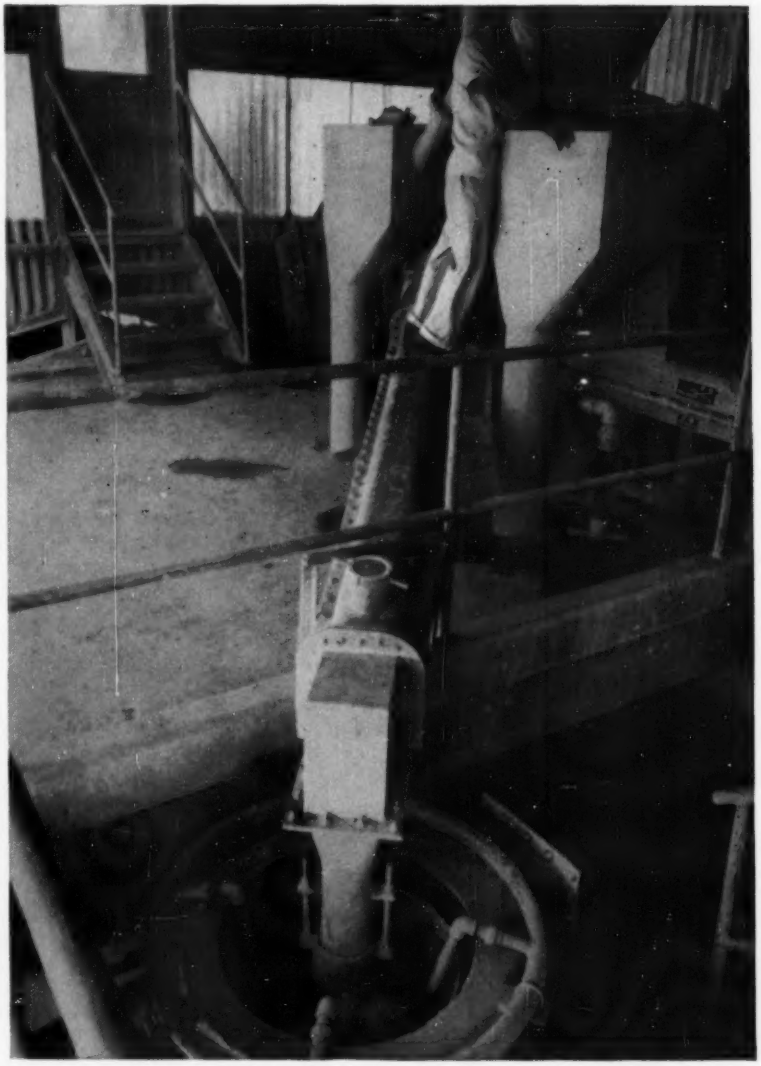
*Sales Service:* Cyanamid sales representatives are available to work with and for you in expanding present markets or in establishing new markets.

**Products you can use**

Cyanamid's only phosphate business is manufacturing the highest quality products for your mixed fertilizer requirements.

- Florida Natural Phosphate Rock.
- TREBO-PHOS* — Triple Superphosphate.
- Phosphoric acid for acidulation.

American Cyanamid Company, Agricultural Division, N. Y. 20, N. Y. **TREBO-PHOS is American Cyanamid Company's trademark for its triple superphosphate.*



*This Cyanamid technician is checking the flow and quality of phosphate rock just before it goes into the cone where it is mixed with phosphoric acid to make Trebo-Phos Triple Superphosphate.*

CYANAMID

**PHOSPHATE PRODUCTS**

*CYANAMID SERVES THE MAN WHO MAKES A BUSINESS OF AGRICULTURE*


Raymond

BAG CORPORATION

*A Division of Albemarle Paper Mfg. Co.*

MIDDLETOWN, OHIO

•MPS gives protection and strength resulting from combining the features of an independent polyethylene tube and a multiwall paper shipping sack to make a flexible package for the most critical requirements of storing and shipping.

•MPS is a production line package that can be filled on regular packing equipment —a package that eliminates troublesome seams and avoids liner slip and pull-out.

•MPS offers the exciting new possibilities for packaging Chemicals and other difficult-to-pack-and-ship products. Get the facts—contact us direct—or ask your Raymond Multiwall man.

**Maker of RUGGED Multiwall Packaging for Industry • Atlanta • Baltimore • Chicago • Kansas City • Louisville • New York**

Arcadian® News

Volume 5 | For Manufacturers of Mixed Fertilizers | Number 11

# Is Your Plant Ready To Operate on Schedule?

## IT PAYS TO CHECK YOUR EQUIPMENT

**Now is the time** to make sure that your plant is in shape for continuous operation throughout the fertilizer production season. By checking your methods and equipment now you can help to avoid breakdowns, replacements, and other interruptions in output of fertilizer during the height of the season.

It is easier to avoid trouble than it is to correct it after it has occurred. Improvised repairs in mid-season are often followed by recurrence of the same production problems causing more delays. Too many of these delays can add up to a low output of tonnage at the end of the season. Here are some suggestions which may help you to keep your plant operating after a smooth start:

### Keep Accurate Records

Failures of heavy equipment can be a serious problem. Parts, such as elevator chains, sprockets, gears, pinions, and bearings, are exposed to heavy strains, abrasion and corrosion. They should start the season in top-notch condition.

Keeping good records on the age and use of parts will help to indicate needed replacements. Squeezing a little more service from parts of doubtful vintage is often a costly procedure in many ways. Some times it takes quite a while to obtain new parts. For example, properly matched sets of large V-belts are often not readily available.

### Inspection Needed Now

Now is the time to check specifications to avoid overloading belts, gears and chains. Also check the conditions and suitability of all fuses, overload releases, shear pins, pressure and vacuum relief valves, and pressure regulators. *Do not use the pressure regulator or the governor as safety valves.*

Plants, too small to employ specialists, sometimes have arrangements with local electricians, pipe fitters and machine shops to promptly handle emergency repairs. Inspections made now by these skilled men may avoid expensive breakdowns and shutdowns later. Equipment manufacturers often will oblige with inspections of their equipment to assure continued satisfactory performance.

### Metering and Weighing

The accuracy of your operation is determined by your scales, meters and measuring tanks. Proper functioning of these metering and weighing devices can greatly influence your profit and loss picture. It pays to be certain that they are accurate.

Have on hand (with gaskets) spare glass metering tubes calibrated for all liquids they are likely to meter. Also, have spare glass tubes for measuring tanks and provide for frequent and thorough cleaning of *all* gauge glass connections. Be sure that all measuring devices are of ample capacity because bottlenecks here are drags on production.

### Air Systems

In automatically-regulated air compressors, when the "ON-OFF" range is too limited, there is a strong probability that the unit is not delivering to maximum capacity and the motor may overheat. If the "OFF" pressure is too near the operating pressure, the receiver tank cannot function properly, because it does not build up a reserve capacity during low demands of operation. Always have the process air well below the safe range of all equipment and do not trust any pressure regulator or governor to double as a safety valve.

Make sure you have adequate air pressure in all tanks before starting the day's operations. Learn how long it takes to build up pressures at different liquid levels in the tanks.

### Avoid High Pressures

If a centrifugal pump is not delivering sufficient volume, this may be caused by excess pressure on the pump's outlet. At

30 pounds pressure, the pump may deliver only half as much volume as at 25 pounds pressure, and may deliver nothing against 40 pounds pressure. The application of only a little air pressure at the pump's supply tank will usually correct the problem.

Avoid high pressures on centrifugal pumps. The system should be protected against excess pressure when positive displacement pumps, such as the piston or gear types, are used. All pumps are sensitive to vapor locking from air or gas. This problem should be suspected when any pump is handling any volatile liquid at temperatures that approach its boiling point.

### Cold Weather Operations

Certain precautions are required in handling nitrogen solutions during cold weather, due to their tendency to "salt out" and block equipment when the temperature goes low. "Salting out" is easy to prevent, especially when the solution moves through short, well-insulated piping direct from insulated tank cars fresh from the nitrogen producer's factory.

If circumstances require operating below the specified "salting out" temperature of the particular nitrogen solution, a few simple safeguards may avoid serious consequences.

When the solutions arrive at your plant, have everything else in the process ready and waiting for the flow of the solutions to start and continue uninterrupted at normal rates.

For insurance, pour a few gallons of hot water over the valve at the tank car or storage tank to dissolve any salts that may block the valve. Then promptly open the valve wide and start operation.

For any prolonged shut-down, force the solution back into the tank and close the valve tightly while the air is passing through it, or drain the piping in any other fashion. For longer shut-down, disconnect the hose at the car to prevent filling the piping through leakage. Provision for similar tactics should be made at the storage tank.

### Choose the Right Solution

Select the proper ARCADIAN® Nitrogen Solution for your particular requirements and prepare your equipment to extend its use right down to the temperature limitations.

Every precaution should be exercised to avoid blocking the piping with nitrogen salts. If this should occur, *never* use heats greater than those of boiling water or low pressure steam to re-dissolve the salts. Pipe joints at frequent intervals will facilitate this freeing operation. Avoid all possible pressure build-up while applying heat.

### Air Line Problems

In cold weather, there is usually more difficulty with the air supply than with nitrogen solutions or acids. Where there is compressed air, there is water. Much of the water is condensed in the air receiver and this tank should be drained each day during cold weather. There are many good filters which will remove most of the moisture from the air before it enters the piping. However, enough moisture does enter the piping to create a serious freezing hazard.

To minimize this hazard, air lines should have a marked slope to some convenient receptacle for draining the accumulation of moisture. Frequent drain points in the air piping are highly recommended.

Some states outlaw the injection of alcohol into the air system and insurance companies take a dim view of this practice. In any event, no inflammable material should be injected into a high-pressure air system because it can cause an explosion.

The high heats of torches for thawing frozen air lines may be hazardous because steam can be pocketed at dangerous pressures. Where the air line is near the nitrogen solution piping, extreme care should be exercised in using high temperatures for thawing the air line.

### Metering in Cold Weather

The specific gravities of the following ARCADIAN® Nitrogen Solutions increase about 1% for each 29°F. drop in temperature of the liquid: NITRANA® 2, 2M, 3, 3M and 7; URANA® 10, 12 and 13. Corresponding figures are 27°F. for NITRANA 6; 33°F. for NITRANA 4 and 4M; 50°F. for U-A-S® A; and 22°F. for U-A-S B.

It is well to consider compensating for the change in specific gravity for Anhydrous Ammonia, for it increases about 1% for each 6°F. drop in its temperature.

The viscosities of the above nitrogen solutions and of anhydrous ammonia are so low at all operating temperatures that no known meter is adversely affected. In changing the settings for flow meters to accommodate changes in specific gravity, note particularly that this is not a direct function of the two specific gravities.

However, the viscosities of some acids are severely influenced and these factors should be taken into account when they are being metered.

*When you need technical assistance, contact Technical Service, Nitrogen Division, Allied Chemical Corporation.*

# Polyethylene Pipe Resists Corrosion in Liquid Lines

**The outstanding** chemical resistance of polyethylene pipe to most of the conditions of fertilizer manufacture makes this inexpensive plastic pipe worthy of consideration for use in liquid lines for corrosive materials.

Polyethylene is classified somewhere between rigid and non-rigid plastics. It is fabricated into many pipe sizes suitable for various pressure requirements. The common 1½ inch pipe size is available in pressure ratings from 75 to 150 pounds at 75°F. The higher molecular weight polyethylene and extrusion methods in use today permit polyethylene pipe to retain most of its strength in surroundings somewhat above 75°F. It is wise to separate or insulate it from steam pipes, hot water lines, or hot roofs.

Since polyethylene pipe is shipped in coils up to 100 feet in length, an installation may often be made with only two or three joints up to the meter or batch tank. Heavy wall pipe needs support only every six or eight feet, while the thinner 75-pound pipe requires much closer support—approximately every two feet. This thin pipe is often strapped down on a wood 2" x 4" fastened to wall studs or along a cement block wall.

### Different Sizes Needed

The thin 75-pound pipe should be used only for the ammoniating solutions within this pressure range. For acids and nitrogen solution having the higher vapor pressure, the 100-pound pipe should be regarded as the minimum. Most acid is moved by pumps and these should be operated well below this pressure. The 1½ inch 100-pound polyethylene pipe costs about the same as 1½ inch extra heavy black iron, but avoids the cost of flanges every 20 feet in the iron pipe.

The black plastic insert fittings used with polyethylene pipe on water service are not suitable for corrosive chemical service. Insert couplings and adaptors should be of 316 stainless steel with two or three stainless steel clamps and stainless steel bolts and nuts at each joint.

When the clamps are unable to pull the pipe down tight enough over the insert fitting, heat must be carefully applied to soften the plastic enough to make a leak-proof joint. Hot water is often not enough, so an acetylene torch in continuous motion at least a foot away from the pipe must be used to soften the plastic slightly. Heat may also be used to relieve strain on bends, but sharp bends or curves should be avoided. Chafing of the pipe is easily avoided by placing rubber around the pipe under the straps.

Plastic pipe is excellent for absorbing vibration from a mixer; at least three feet of plastic pipe should be used for this purpose and if operating personnel are near, only high-pressure polyethylene pipe shielded for safety should be permitted. The shield may be opaque or of safety glass, depending on whether a meter has to be read at the location. Naturally, any chemical lines should be located away from machinery and electric wiring.

Present installations of polyethylene pipe have been entirely satisfactory, particularly in regard to minimum maintenance and sediment-free operation after shut-downs. Meters and sight glasses stay clean longer, and there is no corrosion from dust settling on the outside.

Availability of polyethylene pipe is excellent. *Further details and recommendations may be obtained from Technical Service, Nitrogen Division, Allied Chemical Corporation.*

# HOW THE MAGNETIC FLOW METER WORKS

**The common image** of the electric generator is of a thing of metal and insulation, complete with armatures, field coils, brushes and wires. Paradoxically, in the magnetic flow meter we have an electric generator in which the moving fluid is the armature, the electrodes are the brushes and the field coils are outside the section of pipe in which the liquid flows. Electrical signals are small, and, therefore, the unit needs shielded wire, correctly installed, to avoid interference. Shown below is a cross-section diagram of a typical magnetic flow meter.

### Easy To Read

The voltage generated in the magnetic flow meter is directly proportional (linear) to the velocity of the liquid. The net result, obtained by multiplying velocity by pipe area is a true volume flow meter which measures gallons per minute (or some other volume unit, such as cubic feet per hour) of the fluid *at its flowing condition.* Where a reading in weight units is desired, simply multiply the volume figure by the actual density in pounds per gallon or pounds per cubic foot of the liquid as it passes through the flow meter.

Since the fluid passing through the meter serves as the unit's armature, it must be able to conduct electricity. This need be only as much conductivity as is found in ordinary city water. In fact, in special design units even less conductivity may be used.

There could be occasions where it would be necessary to add a very small amount of high conductivity fluid to the main stream in order to get satisfactory flow meter operation. However, where ARCADIAN Nitrogen Solutions are used this problem cannot arise because these materials are excellent conductors and meter calibration is not affected by any change in liquid conductivity.

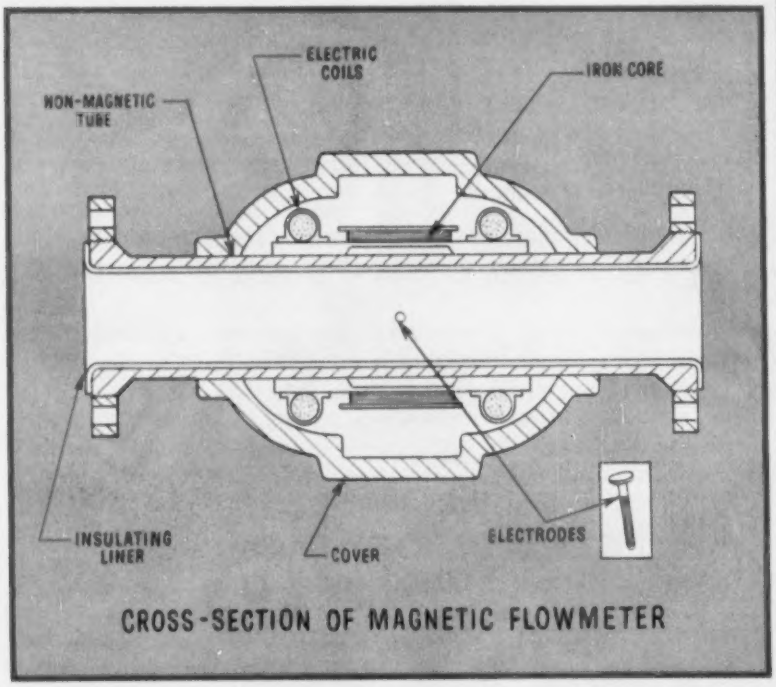
### Meter Design Ideal for the Job

The magnetic flow meter is admirably fitted to its function. It has a smooth interior surface, lack of pressure loss and constant calibration. Changes in density of the liquid will not change the meter's volume reading. One hundred gallons of U-A-S® A produce the same reading as 100 gallons of NITRANA® 4, or any other ARCADIAN Nitrogen Solution.

The magnetic flow meter will measure flow in either direction, with the addition of a reversing switch. Units are available in almost any pipe size and can be hooked up to operate indicators, recorders, integrators and controllers located close by or at remote positions.

### Outstanding Accuracy

The magnetic flow meter is remarkably accurate. Exhaustive tests measuring as much as 10,000 gallons at a time at Nitrogen Division's South Point plant have shown that this flow meter has an accuracy that is better than one per cent of the flow reading. Tests also show that this meter measures volume so accurately that small quantities of entrained gas are included in flow readings. *For more information on the operation and maintenance of magnetic flow meters, write Technical Service, Nitrogen Division, Allied Chemical Corporation.*




CROSS-SECTION OF MAGNETIC FLOWMETER

# Arcadian® NITROGEN SOLUTIONS

| | CHEMICAL COMPOSITION % | | | | | | PHYSICAL PROPERTIES | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total Nitrogen | Anhydrous Ammonia | Ammonium Nitrate | Urea | Water | Neutralizing Ammonia Per Unit of Total N (lbs.) | Approx. Sp. Grav. at 60°F | Approx. Vap. Press. at 104°F per Sq. In. Gauge | Approx. Temp. at Which Salt Begins to Crystallize °F |
| **NITRANA®** | | | | | | | | | |
| 2 | 41.0 | 22.2 | 65.0 | — | 12.8 | 10.8 | 1.137 | 10 | 21 |
| 2M | 44.0 | 23.8 | 69.8 | — | 6.4 | 10.8 | 1.147 | 18 | 15 |
| 3 | 41.0 | 26.3 | 55.5 | — | 18.2 | 12.8 | 1.079 | 17 | -25 |
| 3M | 44.0 | 28.0 | 60.0 | — | 12.0 | 12.7 | 1.083 | 25 | -36 |
| 3MC | 47.0 | 29.7 | 64.5 | — | 5.8 | 12.6 | 1.089 | 34 | -30 |
| 4 | 37.0 | 16.6 | 66.8 | — | 16.6 | 8.9 | 1.184 | 1 | 56 |
| 4M | 41.0 | 19.0 | 72.5 | — | 8.5 | 9.2 | 1.194 | 7 | 61 |
| 6 | 49.0 | 34.0 | 60.0 | — | 6.0 | 13.9 | 1.050 | 48 | -52 |
| 7 | 45.0 | 25.3 | 69.2 | — | 5.5 | 11.2 | 1.134 | 22 | 1 |
| **URANA®** | | | | | | | | | |
| 6C | 43.0 | 20.0 | 68.0 | 6.0 | 6.0 | 9.3 | 1.180 | 12 | 39 |
| 6M | 44.0 | 22.0 | 66.0 | 6.0 | 6.0 | 10.0 | 1.158 | 17 | 14 |
| 10 | 44.4 | 24.5 | 56.0 | 10.0 | 9.5 | 11.0 | 1.114 | 22 | -15 |
| 11 | 41.0 | 19.0 | 58.0 | 11.0 | 12.0 | 9.2 | 1.162 | 10 | 7 |
| 12 | 44.4 | 26.0 | 50.0 | 12.0 | 12.0 | 11.7 | 1.087 | 25 | - 7 |
| 13 | 49.0 | 33.0 | 45.1 | 13.0 | 8.9 | 13.5 | 1.033 | 51 | -17 |
| **DURANA®** | | | | | | | | | |
| DURANA is a trade-mark of Allied Chemical Corporation. | 37.0 | 13.3 | 53.4 | 15.9 | 9.4 | 7.2 | 1.235 | 0 | 36 |
| **U-A-S®** | | | | | | | | | |
| A | 45.4 | 36.8 | — | 32.5 | 30.7 | 16.2 | 0.932 | 57 | 16 |
| B | 45.3 | 30.6 | — | 43.1 | 26.3 | 13.5 | 0.978 | 48 | 46 |
| Anhydrous Ammonia | 82.2 | 99.9 | — | — | — | 24.3 | 0.618 | 211 | -108 |

*DURANA contains 8% formaldehyde.

**Other ARCADIAN® Products: URAN® and FERAN® Solutions • Ammonia Liquor • N-dure® A-N-L® • Ammonium Nitrate • UREA 45 • Nitrate of Soda • Sulphate of Ammonia**

**When you** purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

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**pro or con?...** whether you produce complex, granular, ammoniated, dry-mixed, liquid or bulk-blended fertilizers, you'll find a great deal of informative and helpful data in this article which sprang from the author's efforts to combine . . .

# Bulk Blending with Linear Programming

## a study of 'least-cost' bulk blended fertilizers with linear programming


*by*
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### INTRODUCTION

The main purpose of this study was to determine the usefulness of the linear programming method for arriving at least-cost fertilizer mixes which would result in economies for bulk blending operators and their farmer-customers.

#### *General Objectives*

The objectives were to make a practical application of the linear programming technique (a) to determine the least-cost combination of materials for grades of complete fertilizers at the plant and at the farm, and (b) to determine the least-cost combinations of materials for given ratios of plant nutrients at the plant and at the farm level.

Stated another way the study was designed to answer two specific questions: The first question was: With a given number of ingredients available for use in bulk blending operations, what was the lowest cost combination of these ingredients to obtain any one particular grade of fertilizer? The second question and one in which bulk blending operators usually are more interested was: Given a specific recommendation for a certain ratio of plant nutrients to be used on one field, what was the lowest cost combination of nutrients that could be combined to obtain this ratio? In other words, if the ratio desired should be a 1-1-1 ratio, the question was, should an operator use an 8-8-8, 14-14-14, or something even higher to obtain the least cost combination of total ingredients.

### PROCEDURE USED

#### *Simplex Method of Linear Programming*

In recent years several cost minimization studies using the Simplex Method[1] of linear programming have been published[2]. These studies have investigated the methodology and practicability of using the technique as a tool for determining least cost mixtures of feed and of fertilizers. The present study applies the technique to an actual firm's operation. Hence, the restrictions, materials, costs, and prices pertain to an operating bulk blending plant. The applicability of the procedures used in this study to specific problems in individual states could be explored more fully by bulk blenders with land-grant college or experiment station personnel in their own states.

#### *Source of Data*

Plant description and input-output data were collected from one bulk-blending facility located in the West North Central area. Although the plant was selected because it is a typical one and the data and interpretations relating to it apply broadly, there are cases where price relationships of ingredients will be greatly different and the data contained herein will not be entirely applicable. However, as a general guide, the data and method will be useful especially where price relationships are similar to those used in the present study.

### DESCRIPTION OF FACILITIES AND MATERIALS AVAILABLE

#### *Plant Description*

The case study plant is located adjacent to a rail siding and has loading facilities for moving materials both out of the rail cars into the plant and from the plant to the rail cars. It has six storage bays,

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[1] For a description of the Simplex Method see: A. Charnes, W. W. Cooper, and A. Henderson, **An Introduction to Linear Programming,** John Wiley and Sons, New York, 1953, or Earl O. Heady and Wilfred Candler, **Linear Programming Methods,** Iowa State College Press, Ames, 1958, Chapters 3 and 4.

[2] For example: G. A. Peterson, "Minimum Cost Fertilizers," AE Research Report No. 6, (Mimeographed), University of Illinois, 1955. I. Katzman, "Solving Feed Problems Through Linear Programming," **Journal of Farm Economics,** Vol. 38, pp. 420-429.

Earl R. Swanson, "Solving Minimum Cost Feed Mix Problems," **Journal of Farm Economics,** Vol. 37, pp. 135-139.

Earl R. Swanson, "Programming A Fertilizer Mixing Operation," in E. L. Baum, Earl O. Heady, John T. Pesek, Clifford T. Hildreth (Editors), **Economic and Technical Analysis of Fertilizer Innovations and Resource Use,** Iowa State College Press, Ames, 1957.

**Table 1. Composition and Cost of Fertilizer Materials Available at Bulk Blending Site, 1958**

| Fertilizer Materials | Units[1] N | Plant Nutrient $P_2O_5$ | Plant Nutrient $K_2O$ | Plant Nutrient Total | Delivered Cost Per Ton (Dollars) | Cost Per Pound of Material (Dollars) |
|---|---|---|---|---|---|---|
| Ammonium Nitrate | 33.5 | 0 | 0 | 33.5 | 65.66 | .03283 |
| Ammonium Sulfate | 21 | 0 | 0 | 21 | 43.47 | .02174 |
| Urea | 45 | 0 | 0 | 45 | 107.00 | .05350 |
| Ammonium Phosphate Nitrate | 30 | 10 | 0 | 40 | 69.36 | .03468 |
| Diammonium Phosphate | 21 | 53 | 0 | 74 | 107.56 | .05378 |
| Diammonium Phosphate | 18 | 46 | 0 | 64 | 91.00 | .04550 |
| Ammonium Phosphate | 16 | 48 | 0 | 64 | 104.00 | .05200 |
| Ordinary Superphosphate | 0 | 20 | 0 | 20 | 30.00 | .01500 |
| Triple Superphosphate | 0 | 46 | 0 | 46 | 62.56 | .03128 |
| Concentrated Superphosphate | 0 | 54 | 0 | 54 | 66.80 | .03340 |
| Calcium Metaphosphate | 0 | 62 | 0 | 62 | 77.29 | .03865 |
| Ammoniated Superphosphate | 12 | 36 | 0 | 48 | 72.62 | .03631 |
| Ammoniated Superphosphate | 16 | 16 | 0 | 32 | 56.00 | .02800 |
| Ammoniated Superphosphate | 15 | 15 | 0 | 30 | 52.68 | .02634 |
| Agricultural Lime | 0 | 0 | 0 | -- | 2.28 | .00114 |
| Muriate of Potash | 0 | 0 | 62 | 62 | 35.96 | .01798 |

[1] A unit of plant food is 20 pounds or one percent of a ton.

Six small conventional bulk storage bins are used in the bulk-blending plant studied.

Materials unloading and in-plant handling are done with tractor shovel and platform scale.

**Table 2. Relative Importance of Fertilizer Ratios for the Case Study Plant, 1958**

| Ratio | Percent of Total | Approximate Tons |
|---|---|---|
| 1-1-1 | 32 | 800 |
| 1-3-1 | 7 | 175 |
| 1-4-4 | 4 | 100 |
| 2-1-1 | 4 | 100 |
| 1-2-1 | 3 | 75 |
| Other standard grades | 4 | 100 |
| Non-standard grades | 46 | 1,150 |
| **Total** | **100** | **2,500** |

three on each side of a central bay where the mixing and truck loading operations are carried out. The various fertilizer materials are weighed in a bulk loader and dumped into a charger hopper. The materials are then elevated into a holding bin and are dropped from a screen into a mixer. After mixing, the fertilizers are discharged directly into a spreader truck or other conveyance.

One storage bay is for agricultural lime used as a filler where required. This procedure is necessary in some states where fertilizer laws require that mixed fertilizers or bulk blended fertilizers be sold as an exact grade rather than as a ratio. Generally one bay is used for straight potash materials, one for concentrated superphosphate, one for ammonium sulfate, and one for mono- or di-ammonium phosphate. One additional bay is available for emergency storage.

The total output for the plant during the period July 1, 1957, through June 30, 1958, was approximately 1,000 tons.

### *Materials Available for Bulk Blending Operations*

Materials that were available at this location for bulk blending operations and their cost delivered to the plant are listed in Table 1. These included three straight nitrogen materials, four straight phosphatic materials, and seven multi-nutrient combinations of nitrogen and phosphate. Only one source of granular potash was considered because of its cost advantage and superior physical condition when compared with other sources of potash. Three of the multi-nutrient type materials were ammoniated superphosphate grades (12-36-0, 16-16-0, and 15-15-0). These three grades were made in the TVA-type continuous ammoniator-granulator and supplied by a separate firm. They were not manufactured at the point of bulk blending, thus their delivered costs represented the pri-

ces to the bulk blending firm, not actual cost of the ammoniated product. All other fertilizer materials were supplied by primary producers.

The relative importance of various fertilizer ratios for the case study plant in 1958 are presented in Table 2. It is important to note that 46 percent of the total business of this operation was in the production of non-standard grades. That is, these grades were formulated to meet soil test recommendations. Here, especially, linear programming may provide a useful method of determining least-cost grades.

## Analysis of Data and the Results

### *Grades and Ratios to Which Linear Programming Was Applied*

The ten standard fertilizer ratios selected as the basis of this study were: 2-1-1, 1-3-1, 3-2-2, 1-3-3, 1-1-1, 1-4-4, 1-2-1, 1-3-9, 1-2-2, 0-1-1.

These were chosen since they are the most used ratios in the West North Central area within the past decade.

Least-cost mixtures were devel-

Figure 1. Graphic Summary of Least Cost Grades and Ratios (Cost of Raw Materials Only) for 10 Leading Ratios of Mixed Fertilizers, Case Study Plant, 1958

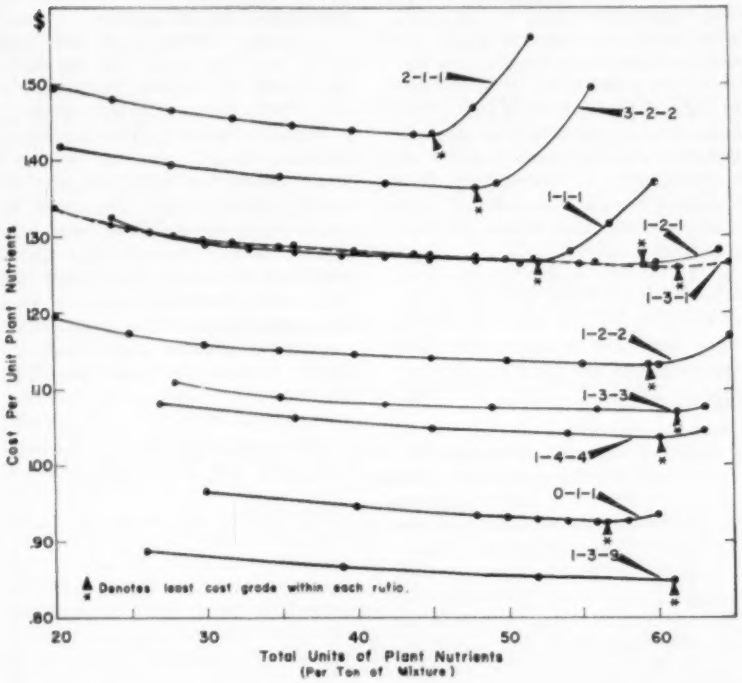



**Table 3. The Least-Cost Combination of Source Materials for the Least-Cost Grades in a Wide Range of Standard Ratios with the Unit Cost Shown for Each Resulting Non-Standard Grade, at One Location in the West North Central States, 1958**

| Ratio | Least Cost Grades[1] | Total Units | Least-Cost Combination of Source-Materials | | | | Cost Per Ton | Cost Per Unit |
|---|---|---|---|---|---|---|---|---|
| | | | 30-10-0 | 18-46-0 | 0-54-0 | 0-0-62 | | |
| | | | Pounds | | | | | |
| 3-1-0 | 30.00-10.00-0 | 40.00 | 2,000 | | | | $69.36 | $1.734 |
| 3-1-1 | 25.83-8.61-8.61 | 43.05 | 1,722 | | | 278 | 64.72 | 1.504 |
| 2-1-0 | 28.56-14.28-0 | 42.84 | 1,762 | 238 | | | 71.94 | 1.680 |
| 2-1-1 | 23.18-11.59-11.59 | 46.36 | 1,432 | 193 | | 375 | 65.19 | 1.406 |
| 3-2-0 | 27.27-18.18-0 | 45.45 | 1,545 | 455 | | | 74.28 | 1.635 |
| 3-2-2 | 21.06-14.04-14.04 | 49.14 | 1,195 | 351 | | 454 | 65.58 | 1.335 |
| 1-1-0 | 24.99-24.99-0 | 49.98 | 1,167 | 833 | | | 78.39 | 1.569 |
| 1-1-1 | 17.81-17.81-17.81 | 53.43 | 831 | 594 | | 575 | 66.19 | 1.239 |
| 1-2-0 | 19.99-39.98-0 | 59.97 | 333 | 1,667 | | | 87.40 | 1.458 |
| 1-2-1 | 15.12-30.24-15.12 | 60.48 | 252 | 1,260 | | 488 | 74.84 | 1.238 |
| 1-2-2 | 12.15-24.30-24.30 | 60.75 | 203 | 1,013 | | 784 | 67.23 | 1.107 |
| 1-3-0 | 15.67-47.01-0 | 62.68 | | 1,742 | 258 | | 87.88 | 1.402 |
| 1-3-1 | 12.51-37.53-12.51 | 62.55 | | 1,390 | 206 | 404 | 77.39 | 1.238 |
| 1-3-3 | 8.91-26.73-26.73 | 62.37 | | 991 | 146 | 863 | 65.49 | 1.050 |
| 1-3-9 | 4.78-14.34-43.02 | 62.14 | | 532 | 79 | 1,389 | 51.82 | .834 |
| 1-4-0 | 12.15-48.60-0 | 60.75 | | 1,350 | 650 | | 83.14 | 1.369 |
| 1-4-2 | 8.72-34.88-17.44 | 61.04 | | 970 | 467 | 563 | 69.86 | 1.145 |
| 1-4-4 | 6.80-27.20-27.20 | 61.20 | | 757 | 364 | 879 | 62.40 | 1.020 |
| 1-5-0 | 9.91-49.55-0 | 59.46 | | 1,102 | 898 | | 80.13 | 1.348 |
| 1-5-5 | 5.50-27.50-27.50 | 60.50 | | 612 | 499 | 889 | 60.50 | 1.000 |
| 1-6-0 | 8.37-50.22-0 | 58.59 | | 931 | 1,069 | | 78.07 | 1.333 |
| 1-6-3 | 5.95-35.70-17.85 | 59.50 | | 662 | 761 | 577 | 65.91 | 1.108 |
| 1-6-6 | 4.62-27.72-27.72 | 60.06 | | 514 | 590 | 896 | 59.21 | .986 |
| 0-1-1 | 0-28.86-28.86 | 57.72 | | | 1,069 | 931 | 52.44 | .909 |
| 0-1-2 | 0-19.68-39.36 | 59.09 | | | 729 | 1,271 | 47.20 | .799 |
| 0-1-3 | 0-14.94-44.82 | 59.76 | | | 554 | 1,446 | 44.50 | .745 |

[1] These grades are the resultant grades when pounds of each material are rounded off to whole pounds.

**Note:** The non-standard grades in this table were not over-formulated.

oped for all commercial grades which might be formulated in these ratios. In addition, the least cost non-standard[1] grade within each ratio was determined.

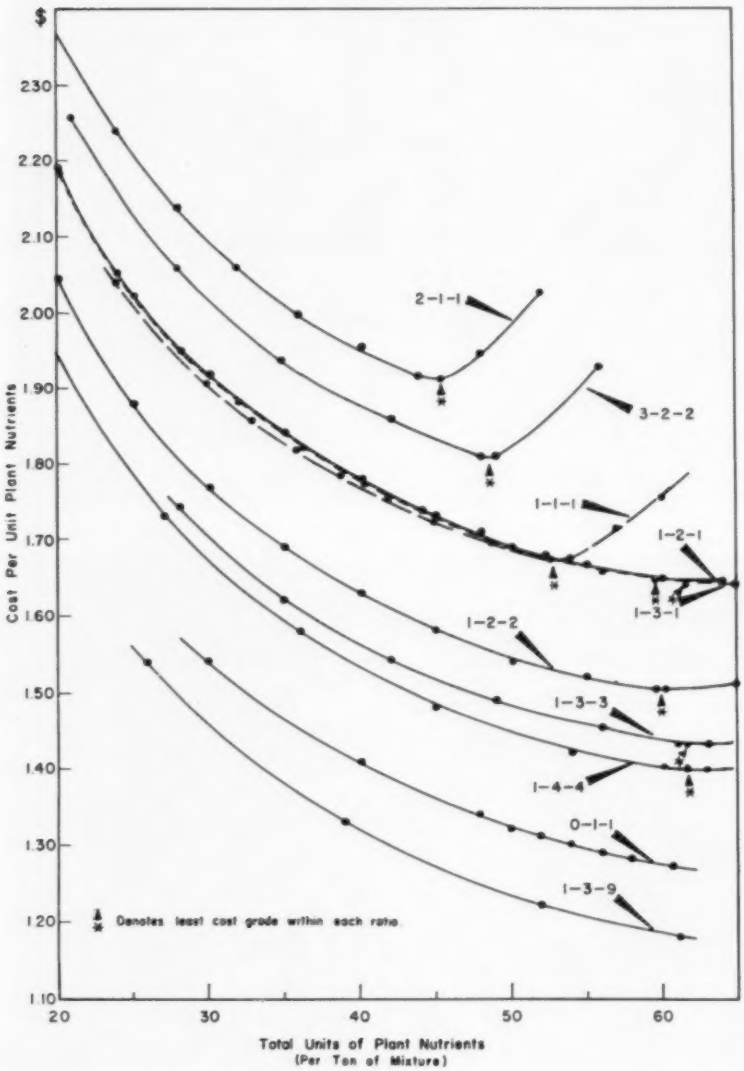
[1] *The term non-standard grade includes all grades in which plant nutrients are guaranteed in partial units, i.e., 17.58-17.58-17.58. In this study any grade which is guaranteed in whole units such as 14-14-14, 15-15-15, etc. is referred to as a "standard" grade even though it is quite possible that some are not generally produced.*

*Least Cost Mixtures for Commercial Grades (At the Plant)*

The least cost mixtures for commercial grades are presented in Appendix Table 1. Each of these grades is over-formulated by two percent of the required plant nutrients to assure meeting minimum plant nutrient requirements as guaranteed by the seller.

A graphic summary of least cost grades and ratios for the ten leading ratios of mixed fertilizers in the West North Central area is shown in Figure 1. This summary indicates clearly that for each of these ratios, the cost per unit of plant nutrient used decreased as the analysis increased, at least to a certain point. Beyond this point, with one exception (the 1-3-9 ratio), cost increased rapidly. This was caused by the need to use much more expensive raw materials in order to produce the higher analysis mixtures.

Figure 2. Graphic Summary of Least Cost Grades and Ratios Spread on the Farm for 10 Leading Ratios of Mixed Fertilizers, Case Study Plant, 1958




One example of the savings which may be realized through programming a bulk blending plant was clearly pointed out in the study of the operations of this one plant. In the year prior to this study, 600 tons of the 1-1-1 ratio produced at the plant was a 12-12-12 grade. The materials cost at the plant for one ton of 12-12-12 was $50.88 as shown below.

| Source Material | Pounds | Cost |
|---|---|---|
| 21-0-0 | 777 | $16.89 |
| 16-48-0 | 510 | 26.52 |
| 0-0-62 | 395 | 7.10 |
| Filler | 318 | .37 |
| Total | 2,000 | $50.88 |

$50.88 ÷ 36 units = $1.413 per unit of plant nutrient.

The linear programming procedure for the least-cost mixture for 12-12-12 produced the following formulation (see Appendix Table 1.)

| Source Material | Pounds | Cost |
|---|---|---|
| 30-10-0 | 816 | $28.30 |
| 0-54-0 | 302 | 10.09 |
| 0-0-62 | 395 | 7.10 |
| Filler | 487 | .56 |
| Total | 2,000 | $46.05 |

$46.05 ÷ 36 units = $1.279 per unit of plant nutrient.

Had the plant been using this latter formulation, the savings in materials cost would have been over $4.80 per ton. This amount of savings in a fertilizer bulk blending operation represents a considerable amount.

However, by producing an even higher analysis 1-1-1 ratio in the form of an approximately 17-17-17 grade, additional savings could have been realized. The 600 tons of 12-12-12 produced in the plant in 1958 was equal in terms of total plant food to 423.6 tons of 17-17-17. The materials cost at the case study plant for 600 tons of 12-12-12 was $30,528.00. The materials cost for the plant nutrient equivalent in the form of 17-17-17 grade (see Appendix Table 1) was equal to 423.6 x $64.42 or a total of $27,288.31. Therefore, the net savings in materials cost, which would have been available if the 17-17-17 grade had been used in lieu of the old formulation cost was $3,239.69. Also, the 17-17-17 grade would have allowed handling almost 30 percent less material than the 12-12-12 grade and thus decreased a portion of the physical handling costs of the bulk blender.

*Least-Cost Grades for Various Ratios (At the Plant)*

Least-cost grades for various ra-

tios also were computed to enable the plant to produce the most plant nutrients for the least cost in any ratio where a specific grade was not required. Least-cost grades for 26 specific ratios are listed in Table 3.

Only four materials, rather than the five or six commonly used materials were necessary to formulate all these least-cost combinations. This finding is of particular importance to bulk blending operators since it indicates the possibility of arriving at least-cost combinations while maintaining a limited number of source materials.

*Least-Cost Grades with Processing and Marketing Costs Added*

In the foregoing analysis the study was of least-cost combinations of source materials at the mixing point. The investigation was extended to study possible additional savings which could be made between the mixing point and the farm. Most of the costs between the mixing point and the farm were, for all practical purposes, the same for each ton of product regardless of its plant nutrient content.

Based on 1957 operations, the average total cost to the bulk blender for operating the plant was $14 per ton of product. This cost included costs of storing, blending, transporting the product to the farm, depreciation on equipment, insurance, advertising, merchandising the product, and all other costs connected with operating the facility.

The retail price at this plant was generally arrived at by adding material costs plus an approximately 12 percent markup to take care of the retail dealer margin, and the actual total handling cost of $14 per ton. With these cost assumptions, the same cost minimization problems that were used at the plant level were used to determine the least-cost mixture on the farm.[1] When these additional costs were added, the over-all effect was to increase the savings possible per unit of plant nutrient by increasing the analysis of the least-cost combination.

The data in Figure 2 present a summary of the costs when delivered on the farm (see Table 2, Appendix, for cost details).

*Over-All Savings Possible On 1-1-1 Ratio Fertilizer*

In order to clarify the findings of the foregoing to some extent one ratio was selected—the 1-1-1 ratio—and the general findings in relation to this one ratio are summarized in Figure 3.

The data in Figure 3 emphasize two major points: (1) savings possible in bulk blending were larger between the plant and the farm than they were at the actual plant level, if least-cost combinations were used at the plant level, and (2) in the particular case studied, fertilizer could be spread on the farmer's land at a price cheaper per unit of plant nutrient than conventional mixtures were being sold to *retail dealers*.

Where least-cost combinations of materials for a 1-1-1 ratio were used for the 1958 plant situation, it was found that the cost of the materials to prepare the bulk blend was reduced from $1.31 per unit for 8-8-8 grade to approximately $1.26 for 17-17-17. These savings of five cents per unit plant nutrient were relatively small when compared to others which were possible.

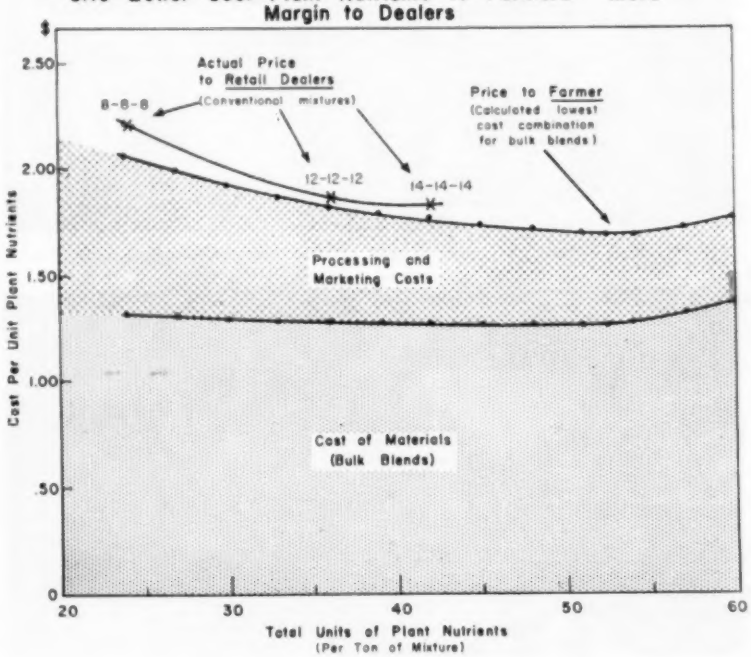
Increasing the analysis of the blended mixture would have had more effect on decreasing the over-all costs to the farmer level than it did to the plant level. At the same time, it would allow the same percentage margins to the dealers and enable the dealer to handle more business with the same storage and bulk blending facilities. When processing and marketing costs were included, the cost of 8-8-8 bulk blended mixture at the farm level was approximately $2.05 per unit while that of 17-17-17 was slightly below $1.70—savings of 35 cents per unit of plant nutrient.

In 1958, an 8-8-8 mixture was selling to retail dealers of the area for $52.50 per ton, 12-12-12 was sell-

**Table 4. Comparison of Least-Cost Commercial and Non-Standard Grades of Blended Fertilizers at the Plant Level and at the Farm Level**

| Ratio | Least-Cost Commercial Grades | | Least-Cost Non-Standard Grades | |
|---|---|---|---|---|
| | Plant Level | Farm Level | Plant Level | Farm Level |
| 2-1-1 | 22-11-11 | 22-11-11 | 22.76-11.38-11.38 | 22.76-11.38-11.38 |
| 3-2-2 | 21-14-14 | 21-14-14 | 20.67-13.78-13.78 | 20.67-13.78-13.78 |
| 1-1-1 | 17-17-17 | 18-18-18 | 17.47-17.47-17.47 | 17.47-17.47-17.47 |
| 1-2-1 | 14-28-14 | 15-30-15 | 14.83-29.66-14.83 | 14.83-29.66-14.83 |
| 1-3-1 | 12-36-12 | 13-39-13 | 12.30-36.90-12.30 | 12.68-38.04-12.68 |
| 1-2-2 | 11-22-22 | 12-24-24 | 11.92-23.84-23.84 | 11.92-23.84-23.84 |
| 1-3-3 | 8-24-24 | 9-27-27 | 8.74-26.22-26.22 | 8.82-26.46-26.46 |
| 1-4-4 | 6-24-24 | 7-28-28 | 6.68-26.72-26.72 | 6.84-27.36-27.36 |
| 1-3-9 | 4-12-36 | 4-12-36 | 4.69-14.07-42.21 | 4.69-14.07-42.21 |
| 0-1-1 | 0-28-28 | 0-30-30 | 0-28.30-28.30 | 0-30.38-30.38 |

Figure 3. Least Cost Combinations of Bulk Blended Materials Give Lower Cost Plant Nutrients to Farmers— More Margin to Dealers




[1] Many of the costs incurred between the plant and the farm are fixed costs per ton of material. Thus, a higher analysis mixture leads to lowered costs per unit of plant nutrient spread on the farm.

ing for $66.50, and 14-14-14 was selling for $76.25. These prices are depicted in Figure 3 by the dashed line joining the three points which represent the unit costs of 8-8-8, 12-12-12, and 14-14-14. These prices were wholesale prices to retail dealers. Before the farmer could get these materials spread on his land, he would have paid an additional 8 to 12 percent of total price as handling charge and margin to the retail dealer and would have incurred all the expenses of picking up the material at the retail dealer's warehouse plus those of spreading the mixtures on the land. Yet the results of the study indicate that a 1-1-1 least cost combination of fertilizer materials could have been bulk blended and spread on the land cheaper than conventional mixtures of materials were being delivered to retail dealers.

It appears then that future cost studies dealing with fertilizers should be oriented toward their cost to farmers, not the costs at a plant. In the past, most studies have dealt with the costs at the mixing plant. This study indicates that the larger share of the savings obtained through higher analysis fertilizers are incurred between the plant and farm application. This suggests that certain basic economies have led to the rapid increase of bulk blending of fertilizers within the past few years.

### Practical Application of Results

The objectives of this study were to make a practical application of the linear programming technique (a) to determine the least-cost combinations of materials for grades of complete fertilizers at the plant and at the farm, (b) to determine the least-cost combinations of materials for given ratios of plant nutrients at the plant and at the farm level. In addition, an investigation was made of the applicability of linear programming methodology to the actual problems of the bulk blending segment of the fertilizer industry.

The study deals with the problems of bulk blenders. No attempt was made to assess the economic or agronomic value of bulk blending at a plant as opposed to farmers bulk blending or direct application of straight materials. Nor was any attempt made to assess the agronomic-economic effects of the practice of bulk blending as such. One small phase of the bulk blending firm's operations is analyzed using one of the newer analytical tools—linear programming.

Formulations for least-cost mixtures were determined for 85 commercial grades of fertilizers, using raw material prices that prevailed at the case study plant in the fall of 1958. These mixtures took into consideration only the cost of the source materials which have been used successfully in bulk blending operations in the general area.

The least-cost grades also were determined for all the popular ratios used in the area in the past decade. For example, if the objective of the firm is to mix the lowest cost mixture of plant nutrients for a 1-1-1 ratio, this study has shown that with prevailing 1958 prices of fertilizer materials, a 17.47-17.47-17.47 was the least-cost guaranteed grade for a 1-1-1 ratio.

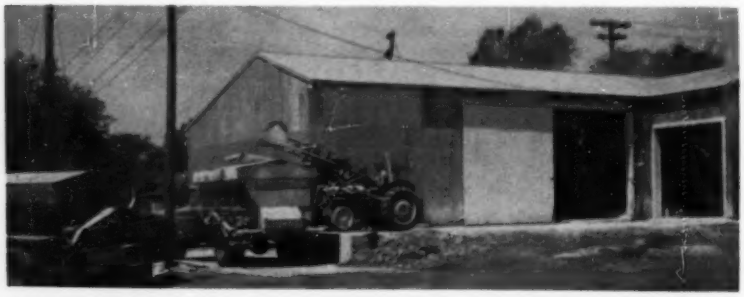
The results of this study also have shown that the linear programming technique, with minor modifications, can be applied equally well to the farm level. That is, by adding the average total costs for processing, marketing, and spreading a ton of given product to the delivered cost of the alternative source materials, both the least-cost mixture for a given grade and the least-cost mixture for a given ratio can be calculated within the linear programming matrix on the basis of the material being spread on the farm. With the exception of three grades in three ratios the resulting least-cost commercial grade within each ratio at the farm level was one grade higher than that at the plant level. Likewise, when the least-cost grades for plant nutrients were calculated at the farm level, the alternative source materials changed and the resulting least-cost grade increased.

Based on the results of this study, several specific courses of action seem advisable for a bulk blending firm:

*1.* Bulk blending operators should, as a general policy, push *high analysis* bulk blended fertilizers when they represent savings over lower analysis grades. This high analysis theme has been advocated in the educational programs of the land-grant colleges, TVA, and other educational programs for many years. Although higher analysis fertilizers usually incur savings there is an optimum economic point in almost every ratio. Even at the farm level this minimum cost point does exist in almost every ratio and manufacturers should consider this at all times since to go above it will *increase* the costs to the farmer.

*2.* The procurement and warehousing problems of the bulk blender can be eased by using the least-cost combination of source materials. Of the grades studied in this investigation, all of the absolute

Load-out into spreader trucks utilizes farm tractor with front-end loader at many bulk blending plants.



Bulk application is shown with power spreader equipped with distributing tubes for 'flow' of dry fertilizer.

**Appendix Table 1. Least-Cost Mixtures for Commercial Grades Bulk Blended Fertilizers At Case Study Plant, Fall 1958**

| Grade | Ingredients (Pounds) | | | | | | | | Cost Per Ton | Number Units | Cost Per Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 45-0-0 | 30-10-0 | 21-53-0 | 18-46-0 | 0-54-0 | 0-62-0 | 0-0-62 | Filler | | | |
| | | | | | 2-1-1 Ratio | | | | | | |
| 10-5-5 | --- | 679 | --- | --- | 63 | --- | 165 | 1,093 | $29.87 | 20 | $1.494 |
| 16-8-8 | --- | 1,088 | --- | --- | 101 | --- | 263 | 548 | 46.45 | 32 | 1.452 |
| 20-10-10 | --- | 1,360 | --- | --- | 126 | --- | 329 | 185 | 57.50 | 40 | 1.438 |
| 22-11-11 | --- | 1,496 | --- | --- | 139 | --- | 362 | 3 | 63.03 | 44 | 1.433 |
| 26-13-13 | 630 | 545 | 397 | --- | --- | --- | 428 | --- | 81.66 | 52 | 1.570 |
| | | | | | 3-2-2 Ratio | | | | | | |
| 9-6-6 | --- | 612 | --- | --- | 113 | --- | 198 | 1,077 | 29.78 | 21 | 1.418 |
| 15-10-10 | --- | 1,020 | --- | --- | 189 | --- | 329 | 462 | 48.13 | 35 | 1.375 |
| 18-12-12 | --- | 1,224 | --- | --- | 227 | --- | 395 | 154 | 57.31 | 42 | 1.365 |
| 21-14-14 | --- | 1,212 | 196 | 131 | --- | --- | 461 | --- | 66.83 | 49 | 1.364 |
| 24-16-16 | 659 | 245 | 570 | --- | --- | --- | 526 | --- | 83.87 | 56 | 1.498 |
| | | | | | 1-1-1 Ratio | | | | | | |
| 8-8-8 | --- | 544 | --- | --- | 202 | --- | 263 | 991 | 31.48 | 24 | 1.312 |
| 12-12-12 | --- | 816 | --- | --- | 302 | --- | 395 | 487 | 46.05 | 36 | 1.279 |
| 15-15-15 | --- | 1,020 | --- | --- | 378 | --- | 494 | 108 | 57.00 | 45 | 1.267 |
| 17-17-17 | --- | 903 | --- | 421 | 116 | --- | 560 | --- | 64.42 | 51 | 1.263 |
| 20-20-20 | 486 | 106 | 750 | --- | --- | --- | 658 | --- | 81.85 | 60 | 1.364 |
| | | | | | 1-2-1 Ratio | | | | | | |
| 5-10-5 | --- | 340 | --- | --- | 315 | --- | 166 | 1,179 | 26.63 | 20 | 1.332 |
| 10-20-10 | --- | 680 | --- | --- | 630 | --- | 329 | 361 | 50.95 | 40 | 1.274 |
| 12-24-12 | --- | 816 | --- | --- | 756 | --- | 395 | 33 | 60.73 | 48 | 1.265 |
| 14-28-14 | --- | 434 | --- | 863 | 242 | --- | 461 | --- | 70.69 | 56 | 1.262 |
| 16-32-16 | --- | 262 | 990 | 222 | --- | --- | 526 | --- | 81.89 | 64 | 1.280 |
| | | | | | 1-3-1 Ratio | | | | | | |
| 4-12-4 | --- | 272 | --- | --- | 403 | --- | 132 | 1,193 | 26.62 | 20 | 1.331 |
| 8-24-8 | --- | 543 | --- | --- | 806 | --- | 265 | 386 | 50.95 | 40 | 1.274 |
| 10-30-10 | --- | 651 | --- | 48 | 972 | --- | 329 | --- | 63.14 | 50 | 1.263 |
| 12-36-12 | --- | 77 | --- | 1,232 | 296 | --- | 395 | --- | 75.72 | 60 | 1.262 |
| 13-39-13 | --- | --- | 585 | 791 | --- | 196 | 428 | --- | 82.73 | 65 | 1.273 |
| | | | | | 1-2-2 Ratio | | | | | | |
| 4-8-8 | --- | 272 | --- | --- | 251 | --- | 264 | 1,213 | 23.94 | 20 | 1.197 |
| 8-16-16 | --- | 544 | --- | --- | 505 | --- | 526 | 425 | 45.68 | 40 | 1.142 |
| 10-20-20 | --- | 680 | --- | --- | 630 | --- | 658 | 32 | 56.49 | 50 | 1.130 |
| 11-22-22 | --- | 458 | --- | 483 | 335 | --- | 724 | --- | 62.07 | 55 | 1.129 |
| 13-26-26 | 70 | 92 | 983 | --- | --- | --- | 855 | --- | 75.18 | 65 | 1.157 |
| | | | | | 1-3-3 Ratio | | | | | | |
| 4-12-12 | --- | 272 | --- | --- | 403 | --- | 395 | 930 | 31.05 | 28 | 1.109 |
| 5-15-15 | --- | 341 | --- | --- | 504 | --- | 493 | 662 | 38.26 | 35 | 1.093 |
| 7-21-21 | --- | 476 | --- | --- | 705 | --- | 691 | 128 | 52.63 | 49 | 1.074 |
| 8-24-24 | --- | 298 | --- | 410 | 502 | --- | 790 | --- | 59.96 | 56 | 1.071 |
| 9-27-27 | --- | --- | 257 | 721 | --- | 134 | 888 | --- | 67.78 | 63 | 1.076 |
| | | | | | 1-4-4 Ratio | | | | | | |
| 3-12-12 | --- | 204 | --- | --- | 415 | --- | 395 | 986 | 29.15 | 27 | 1.080 |
| 4-16-16 | --- | 273 | --- | --- | 554 | --- | 526 | 647 | 38.17 | 36 | 1.060 |
| 5-20-20 | --- | 340 | --- | --- | 693 | --- | 658 | 309 | 47.12 | 45 | 1.047 |
| 6-24-24 | --- | 357 | --- | 84 | 769 | --- | 790 | --- | 56.08 | 54 | 1.039 |
| 7-28-28 | --- | --- | 303 | 440 | --- | 336 | 921 | --- | 65.86 | 63 | 1.045 |
| | | | | | 1-3-9 Ratio | | | | | | |
| 2-6-18 | --- | 136 | --- | --- | 201 | --- | 593 | 1,070 | 23.31 | 26 | .897 |
| 3-9-27 | --- | 204 | --- | --- | 302 | --- | 889 | 605 | 33.83 | 39 | .867 |
| 4-12-36 | --- | 272 | --- | --- | 403 | --- | 1,184 | 141 | 44.34 | 52 | .853 |
| | | | | | 0-1-1 Ratio | | | | | | |
| 0-15-15 | --- | --- | --- | --- | 566 | --- | 494 | 940 | 28.85 | 30 | .962 |
| 0-20-20 | --- | --- | --- | --- | 756 | --- | 658 | 586 | 37.75 | 40 | .944 |
| 0-25-25 | --- | --- | --- | --- | 944 | --- | 823 | 233 | 46.60 | 50 | .932 |
| 0-28-28 | --- | --- | --- | --- | 1,058 | --- | 921 | 21 | 51.92 | 56 | .927 |
| 0-30-30 | --- | --- | --- | --- | 200 | 813 | 987 | --- | 55.84 | 60 | .931 |

**Appendix Table 2. Cost of Least-Cost Combinations of Materials for both the Commercial and Non-Standard Grades of Ten Ratios Delivered to the Farm**

| Grade | Costs of Raw Materials Plus Processing and Marketing Costs | | Grade | Costs of Raw Materials Plus Processing and Marketing Costs | |
|---|---|---|---|---|---|
| | Per Ton | Per Unit | | Per Ton | Per Unit |
| | | | 2-1-1 Ratio | | |
| 10-5-5 | $47.45 | $2.373 | 20-10-10 | $78.40 | $1.960 |
| 12-6-6 | 53.67 | 2.236 | 22-11-11 | 84.59 | 1.923 |
| 14-7-7 | 59.84 | 2.137 | 22.76-11.38-11.38[1] | 87.00 | 1.911 |
| 16-8-8 | 66.02 | 2.063 | 24-12-12 | 93.66 | 1.951 |
| 18-9-9 | 72.20 | 2.005 | 26-13-13 | 105.46 | 2.028 |
| | | | 3-2-2 Ratio | | |
| 9-6-6 | 47.35 | 2.255 | 21-14-14 | 88.84 | 1.813 |
| 12-8-8 | 57.60 | 2.057 | 20.67-13.78-13.78[1] | 87.44 | 1.813 |
| 15-10-10 | 67.91 | 1.940 | 24-16-16 | 107.93 | 1.927 |
| 18-12-12 | 78.19 | 1.862 | | | |
| | | | 1-1-1 Ratio | | |
| 8-8-8 | 49.26 | 2.052 | 15-15-15 | 77.92 | 1.732 |
| 9-9-9 | 53.32 | 1.975 | 16-16-16 | 81.93 | 1.707 |
| 10-10-10 | 57.41 | 1.914 | 17-17-17 | 86.15 | 1.689 |
| 11-11-11 | 61.49 | 1.863 | 17.47-17.47-17.47[1] | 88.13 | 1.681 |
| 12-12-12 | 65.58 | 1.822 | 18-18-18 | 90.83 | 1.682 |
| 13-13-13 | 69.65 | 1.786 | 19-19-19 | 97.97 | 1.719 |
| 14-14-14 | 73.79 | 1.757 | 20-20-20 | 105.67 | 1.761 |
| | | | 1-2-1 Ratio | | |
| 5-10-5 | 43.83 | 2.191 | 12-24-12 | 82.02 | 1.709 |
| 6-12-6 | 49.24 | 2.051 | 13-26-13 | 87.55 | 1.684 |
| 7-14-7 | 50.69 | 1.953 | 14-28-14 | 93.17 | 1.664 |
| 8-16-8 | 60.17 | 1.880 | 14.83-29.66-14.83[1] | 97.82 | 1.649 |
| 9-18-9 | 65.61 | 1.822 | 15-30-15 | 98.99 | 1.650 |
| 10-20-10 | 71.06 | 1.777 | 16-32-16 | 105.72 | 1.652 |
| 11-22-11 | 76.52 | 1.739 | | | |
| | | | 1-3-1 Ratio | | |
| 4-12-4 | 43.81 | 2.191 | 10-30-10 | 84.72 | 1.694 |
| 5-15-5 | 50.61 | 2.025 | 11-33-11 | 91.76 | 1.668 |
| 6-18-6 | 57.44 | 1.915 | 12-36-12 | 98.81 | 1.647 |
| 7-21-7 | 64.29 | 1.837 | 12.68-38.04-12.68[1] | 101.92 | 1.608 |
| 8-24-8 | 71.06 | 1.777 | 13-39-13 | 106.66 | 1.641 |
| 9-27-9 | 77.88 | 1.731 | | | |
| | | | 1-2-2 Ratio | | |
| 4-8-8 | 40.81 | 2.041 | 10-20-20 | 77.27 | 1.545 |
| 5-10-10 | 46.89 | 1.876 | 11-22-22 | 83.52 | 1.519 |
| 6-12-12 | 52.99 | 1.766 | 11.92-23.84-23.84[1] | 89.30 | 1.498 |
| 7-14-14 | 59.04 | 1.687 | 12-24-24 | 89.96 | 1.499 |
| 8-16-16 | 65.16 | 1.629 | 13-26-26 | 98.20 | 1.511 |
| 9-18-18 | 71.19 | 1.582 | | | |
| | | | 1-4-4 Ratio | | |
| 2-8-8 | 36.64 | 2.035 | 6-24-24 | 76.81 | 1.422 |
| 3-12-12 | 46.65 | 1.728 | 6.84-27.36-27.36[1] | 85.68 | 1.391 |
| 4-16-16 | 56.75 | 1.576 | 7-28-28 | 87.76 | 1.393 |
| 5-20-20 | 66.77 | 1.484 | | | |
| | | | 1-3-3 Ratio | | |
| 4-12-12 | 48.78 | 1.742 | 8-24-24 | 81.16 | 1.450 |
| 5-15-15 | 56.85 | 1.624 | 8.82-26.46-26.46[1] | 88.08 | 1.426 |
| 6-18-18 | 64.67 | 1.540 | 9-27-27 | 89.99 | 1.427 |
| 7-21-21 | 72.95 | 1.489 | | | |
| | | | 1-3-9 Ratio | | |
| 1-3-9 | 28.34 | 2.180 | 4-12-36 | 63.66 | 1.224 |
| 2-6-18 | 40.11 | 1.543 | 4.69-14.07-42.21[1] | 72.04 | 1.182 |
| 3-9-27 | 51.89 | 1.331 | | | |
| | | | 0-1-1 Ratio | | |
| 0-15-15 | 46.31 | 1.544 | 0-27-27 | 70.17 | 1.299 |
| 0-20-20 | 56.28 | 1.407 | 0-28-28 | 72.15 | 1.288 |
| 0-24-24 | 64.22 | 1.338 | 0-29-29 | 74.31 | 1.281 |
| 0-25-25 | 66.19 | 1.324 | 0-30-30 | 76.54 | 1.276 |
| 0-26-26 | 68.17 | 1.311 | 0-30.38-30.38[1] | 77.42 | 1.274 |

[1] Least-cost combination within the ratio.

least-cost grades can be formulated with only four source materials. Also, 81 pecent of the least cost commercial grades could be formulated with only five source materials at the plant considered in this study. Least-cost formulations are the most economical from the standpoint of raw material costs. Raw materials represent approximately 72 percent of the cost of fertilizers at the farm level. Therefore, if a bulk blender decides to use ingredients other than those indicated by the least-cost formulation, it ought to be done on a basis other than cost (better physical handling qualities, availability, etc.).

3. Study of the plant operations from a point of economic considerations indicates that the sales approach of bulk blenders ought to be "geared to" a complete soil fertility program. The sales program ought to be "geared to" selling plant nutrients in terms of N, $P_2O_5$, and $K_2O$ as recommended by the soil tests rather than sales of 8-8-8, 10-10-10, etc. This approach will enable the bulk blender to deliver the required plant nutrients to the farmers at the lowest possible cost, while at the same time obtaining reasonable returns for his services.

This article is based upon the results of a cooperative project between the University of Nebraska and the Agricultural Economics Branch, Division of Agricultural Relations, Tennessee Valley Authority.

A more comprehensive study is currently being published by TVA as a technical publication under the title "Use of Linear Programming Technique to Compute Least Cost Bulk Blended Fertilizers." Copies of the technical publication may be obtained by writing directly to TVA requesting this publication.

## SUMMARY

**1.** The linear programming technique may be applied to practical plant problems of minimizing the cost of fertilizer materials to be used by bulk blenders.

**2.** In this case study the linear programming technique was used to determine the least-cost formulations for eighty-five (85) different commercial grades of bulk blended fertilizers.

**3.** A modification of the technique was used to determine the least-cost grade within each of the 26 ratios used in the area studied within the decade of the fifties.

**4.** Results of the study have shown that the linear programming technique with minor modifications to the input data can be applied to determine least-cost grades and ratios at the farm level as well as at the operating plant level.

**5.** Based on the economic results of this study, several specific courses of action seem advisable for a bulk blending firm:

**a.** Bulk-blenders should, as a general policy, push **high-analysis** bulk blends when they represent savings to farmers over lower analysis grades. There is a point in increasing analysis in almost every ratio beyond which they should not go. To do so increases costs to farmers or lowers margins to cover operating costs.

**b.** Procurement and warehousing problems can be simplified by using applications of linear programming techniques.

**c.** Bulk-blenders can save money for farmers and for themselves by pushing a complete soil fertility program based upon using the amounts and types of plant nutrients needed for specific crops on specific land—rather than the old "shot gun" approach.

# Research Briefs

**Cotton** research projects include one at Texas A & M which is a search for the substance in the cotton which attracts the boll weevil, and on which he thrives. If found, it might be bred out of the cotton, thus starving him to death.

**Fungi** can also be starved to death, it seems. For example, the fungi that attack canning peas depend on sulphur for food, taken directly from the plant. By reducing the concentration of sulphur in compounds, the fungus did not grow—according to W. A. Haglund and T. H. King,—University of Minnesota.

**Plastic overcoats** for fertilizers have been tested and permit normally fast-moving fertilizers to be slowly released, according to Dr. Kirk Lawson, Michigan State.

**Wheat** responds more profitably to fertilizer than almost any other crop, says Dr. Floyd W. Smith, Kansas State, reporting an average of $2.50 profit from each dollar of fertilizer applied to wheat.

**A 3-year fertilizer** is the aim of TVA's Dr. Lewis Bradley Nelson. The TVA researchers are hoping to develop a nitrogen-base fertilizer so concentrated that it will last three years. Research on this has been going on for two years now, and is expected to correct the fact, stated by Dr. Nelson, that about half the N used in fertilizers is never consumed by the plants.

**One corn root** could supply all the plant food needed for normal plant growth, says Purdue's Dr. A. J. Ohlrogge. He found that roots would not seek the plant food in a side-band—but did fine when the fertilizer was placed one to three inches below and to one side of the seed. *But*, Paul Burson of Minnesota says extensive root growth could be an advantage, especially in a dry year, and can be encouraged by a good nitrogen starter.

**Not water:** Soil acidity in humid regions is caused largely by nitrate ions acting on acid-neutralizing elements in the soil,—not by improper water management, says USDA's ARS researcher W. A. Raney. And Clemson Dean Emeritus, Dr. H. P. Cooper says half the money spent for fertilizer by South Carolina farmers is lost due to soil acidity.

**Russia's** Kazakh Academy of Science claims to have made mineral fertilizers out of molten magnesium phosphate . . . and Colorado State says one import from Russia is OK: Russian wild rye, which thrives in dry land. Known as Vinall grass, this is actually a refinement of the Russian grass, developed by the Great Plains field station of Agriculture Research Service.

**Non-burning fertilizers.** Fertilizers which won't damage or 'burn" either roots or foliage of plants, even when applied in excess, have been developed at the Washington Research Center of W. R. Grace & Co. Seeds germinate and plants grow in this series of new phosphorus fertilizer compounds without the presence of soil.

**Better roots** are put down by fertilized corn, which thus does better in a dry year, according to Lawrence Fine, Dakota State College.

**Roots, too, absorb** carbon dioxide gas, according to some tests on soybeans by U. of Minnesota.—something once thought possible only in leaves,—and the idea that only roots could absorb minerals has been disproven with radio-active phosphorous. Now they are looking for the "remote control" mechanism in the plant which directs movement of the particles absorbed.

## Liquid Phosphorus Method by Monsanto Executive

Edgar Monsanto Queeny, chairman of the finance committee of Monsanto Chemical Company, St. Louis, has invented a method for the direct use of liquid phosphorus as fertilizer.

His patent for the system, granted recently, is assigned to the company, world's largest producer of elemental phosphorus.

While phosphorus burns spontaneously upon contact with air, according to the patent it can be safely injected as a liquid into the earth, where it solidifies and slowly combines with oxygen.

Mr. Queeny reports that the liquid phosphorus will not interfere with the germination of seeds or the growth of plant roots if it is applied an inch or more away from them. It also should be released, he says, at least two inches below the surface.

The equipment described in the patent (No. 2,947,269) can be mounted on or pulled by a tractor. Hot water circulating through the tank jacket keeps the phosphorus liquid, and it is discharged through a pipe that moves through the ground behind the cutting blade of a plow. A conventional planter can be made part of the machine.

The use of pure phosphorus is said to offer advantages in making the element available as plant food for a considerable time.

The company has not promoted the method because at present it can't compete on a cost basis.

Monsanto mines phosphorus in Idaho and Tennessee. Mr. Queeny has been connected with the company since he graduated from Cornell University in 1919. He was chairman from 1943 until he gave up the post last March.

# HONORS

### Two IMC Men Honored

*Eugene Landis*, director of transportation for International Minerals & Chemical Corporation, Skokie, Ill., is being congratulated on being elected president of the Associated Traffic Clubs of America.

*Dr. I. Milton LeBaron*, director of research, engineering, and development for IMC, was one of 10 U. S. scientists invited to participate in an international physics symposium on high voltage electrostatic forces September 27 through October 1 in Grenoble, France.

The symposium is sponsored by the French National Scientific Research Center. Dr. LeBaron spoke there September 29 on "Electrostatic Separation of Minerals." He is holder of 27 patents in minerals processing.

### Spencer Award

One of the nation's top cereal chemists, *Dr. C. H. Bailey*, Dean Emeritus of the Institute of Agriculture, University of Minnesota, has been selected as the 1960 winner of the Charles F. Spencer Award. Given for outstanding achievement in the field of agricultural and food chemistry, the award includes a medallion and a $1,000 honorarium. It was established by the late Kenneth A. Spencer, founder of Spencer Chemical Company, in memory of his father and is administered by the Kansas City Section of the American Chemical Society.

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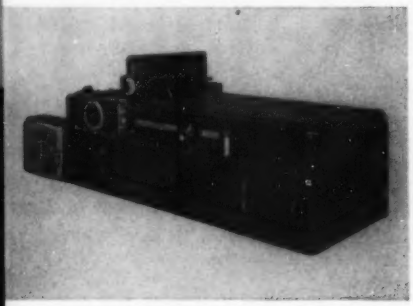

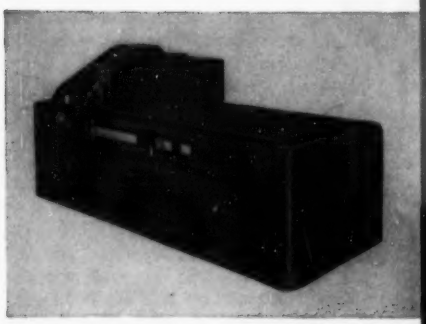

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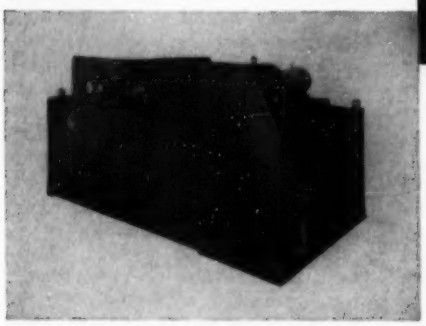

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**Wide Range** – 10:1
**Bulletin** – 35.20A-1

**MODEL 36-20**
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**Wide Range** – 10:1 (constant speed drive); 50:1 (variable speed drive)
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This is the fourth in a series of articles covering various aspects of the fertilizer dealer-farmer survey made by the authors.

# Factors Limiting Services *offered by* Retail Fertilizer Dealers

*by* GEORGE M. BEAL, JOE M. BOHLEN *and* HERBERT LAWRENCE CAMPBELL III

In the current era of highly competitive fertilizer retailing, the use of fertilizer related services seems to be one of the most effective—if not the most effective—method of competing for the farmers' fertilizer dollars.

The nature of these effective services varies widely—from physical services such as bulk spreading and soil sampling to relatively intangible services such as the dealer providing the farmer with information about fertilizer and fertilizer use—but both the tangible and the relatively less observable services seem extremely effective in competing for the fertilizer market. Yet most dealers are not utilizing fertilizer-related services to fullest advantage.

The nature of the services presently offered by retail fertilizer dealers provides a base point for a discussion of factors limiting fertilizer-related services, and some indication of services which seem relatively effective but which are being offered by only a small number of dealers.

Table 1 below shows the percentage of dealers using each of a number of fertilizer-related services and promotional activities, and the proportion of the same group of dealers who thought they **should** be offering the service. These data are from a study of 118 randomly selected Iowa retail fertilizer dealers interviewed during the spring of 1958 by The Iowa Agricultural Experiment Station in collaboration with the Tennessee Valley Authority. These 118 dealers comprised about 7 percent of Iowa's retail fertilizer dealers.

Of the six services which more dealers thought they should offer than were presently offering, five are of an educational nature—fertilizer clinic, soil sampling and testing, and demonstration plots—with the sixth being a spreading service. In general the services with the greatest difference between the percentage who are actually offering them and the percentage who think they should be offering them are those services which are presently used by relatively few dealers. But the dealer's perception of what he **should** offer does not mean that he will offer it if it is unprofitable. The average gross fertilizer profit of dealers offering each of the services (Table 2) provides a rough indication of the profitability of ofering each of the services. However, this provides no more than a rough measure, since the effect of other services and the nature of the total business interact strongly to effect the fertilizer gross profit.

**Table 1.—Comparison of Percentage of Dealers Offering Each Service with Percentage Saying They Should Offer Each Service**

| | Percent Offering | Percent Thought Should Offer | Difference |
|---|---|---|---|
| Fertilizer clinic | 17 | 26 | + 9 |
| Take soil samples | 35 | 48 | + 7 |
| Soil testing (own lab) | 10 | 17 | + 7 |
| Fertilizer demonstration plot | 13 | 16 | + 3 |
| Send in soil samples for farmers | 49 | 51 | + 2 |
| Spread liquid fertilizer | 18 | 20 | + 2 |
| Anhydrous application | 12 | 11 | — 1 |
| Bulk application | 50 | 49 | — 1 |
| On-farm fertilizer sales | 53 | 49 | — 4 |
| Fair displays and booths | 25 | 20 | — 5 |
| Small dry fertilizer spreader | 36 | 28 | — 8 |
| Throw-aways and mailings | 36 | 24 | —12 |
| Interpret soil test results for customers | 51 | 35 | —16 |
| Volume discounts | 55 | 38 | —17 |
| Seasonal discounts | 68 | 41 | —27 |
| Advertising | 59 | 31 | —28 |
| Self-haul discount to farmers | 69 | 36 | —33 |
| Help farmers plan long-range fertilization program | 75 | 39 | —36 |
| Credit | 79 | 34 | —45 |

Data in this paper are from Iowa State University Experiment Station Project No. 1352 done in cooperation with the Agricultural Economics Branch, Division of Agricultural Relations, Tennessee Valley Authority. The project is under the co-leadership of George M. Beal and Joe M. Bohlen, professors of rural sociology, Department of Economics and Sociology, Iowa State University. Data are taken from three phases of Project No. 1352. These phases were under the supervision of assistant professor John Harp, and graduate assistants Larry Campbell and Quentin Jenkins. They were assisted by graduate assistant research team members Larry Kasperbauer, Daryl Hobbs and Richard Warren.

Two new types of fertilizer merchandising techniques come to the top when fertilizer gross profit is compared with the utilization of specific services: (1) fair displays and booths, and (2) throw-aways or mailings. However, these merchandising techniques tend to be characteristics of very large businesses in which fertilizer may or may not be considered important. Thus their relationship to fertilizer gross profit is not as direct as the one between use of educational techniques and certain of the spreading services, which still rate highly when related to fertilizer gross profit.

The same sorts of relationships are also true of the relatively less tangible services. Dealers who feel that they should make recommendations to the farmer about amount, analysis and spreading method for fertilizer tend to have higher fertilizer sales volumes, gross profits, and fertilizer mark-ups than those dealers who do not. The same is true of those dealers who feel they should be a reliable source of information about fertilizer.

The question then—if use of fertilizer merchandising techniques is related to fertilizer profits—is why more dealers are not offering these services or merchandising techniques.

Several factors seem to interact in limiting the number of merchandising techniques used by the dealers in selling fertilizer. First, and perhaps most important to a large group of the dealers, many feel that their fertilizer markup is so low they can't afford to offer any services. The 118 dealers were obtaining an average fertilizer mark-up of 9.3 percent; only about a fourth of the dealers getting fertilizer mark-ups of over 10 percent. And only 21 percent of the dealers considered their fertilizer mark-up adequate; the remaining 79 percent said it was "inadequate." In contrast, the dealers were getting an average mark-up of 14.9 percent on other commodities they sold.

**Table 2.—Relationship between Offering of Specific Fertilizer Merchandising Techniques and Fertilizer Gross Profit.**

| | Avg. Fert. Gross Profit |
|---|---|
| Fair displays and booths | $8,930 |
| Spreading liquid fertilizer | $7,869 |
| Fertilizer clinic | $6,515 |
| Throw-aways or mailings | $6,473 |
| Take soil samples for farmers | $5,987 |
| Fertilizer demonstration plot | $5,940 |
| Bulk application | $5,798 |
| Soil testing (own lab) | $5,239 |
| Sending in soil samples for farmers | $5,224 |
| Calling on farmers | $5,015 |
| Interpreting soil test results | $4,985 |
| Advertising | $4,977 |
| Self-haul discount for farmers | $4,730 |
| Anhydrous application | $4,724 |
| Seasonal discounts | $4,470 |
| Small dry fertilizer spreader | $4,443 |
| Credit | $4,090 |
| Helping farmers plan long-range fertilizer programs | $3,117 |
| Volume discounts | $2,420 |
| **All-Dealer Average** | **$4,004** |

Fertilizer gross profits averaged just over $4,000 for the 118 dealers; the average fertilizer sales volume was about $45,600. Fertilizer comprised an average of 14.8 percent of the dealers' total business volumes. These figures combine to give some indication of fertilizer's small economic role in the dealers' businesses. This general situation is perhaps best shown by the dealers' answers to a general question inquiring why they didn't "push" fertilizer harder. Their responses were:

| Responses | Percent |
|---|---|
| Low profit return | 32 |
| Lack of time | 22 |
| Lack of facilities | 12 |
| Having to offer credit | 8 |
| Heavy sales competition | 2 |
| Push as hard as we can | 11 |

Some indication of the potential result of aggressive fertilizer merchandising is given by the fact that the dealers who said they were pushing fertilizer as hard as they could had average fertilizer sales of $91,492. The all-dealer average was about half this, $45,600.

In addition to the 32 percent who named lack of profit as a factor limiting the extent to which they pushed fertilizer sales, this same lack of profit appears to be an implicit factor behind some of the other factors named as acting to limit the dealers' fertilizer promotional activities. For example, both lack of time and lack of facilities are problems which certainly could be overcome by the dealers if their marginal returns for investing time and capital in the fertilizer department of their business were adequate; that is, they were as great or greater than for other departments of their businesses. Adding substantiation to this hypothesis are the average fertilizer mark-ups of the dealers giving each of these responses. Those who mentioned low profit margins had average fertilizer mark-ups of 8.2 percent; those who mentioned lack of time and lack of facilities had fertilizer mark-ups of 8.2 and 8.6 percent respectively. The average fertilizer mark-up for those who said they were pushing fertilizer as hard as they could was 12.3 percent, as compared with the all-dealer average of 9.3 percent.

To obtain more specific information about the role assigned fertilizer in the over-all business by the dealer, the 118 dealers were asked what role fertilizer played in their business. Their responses were:

| Responses | Percent |
|---|---|
| An important service to bring in business | 31 |
| A good money maker in itself | 26 |
| Just another service to customers | 26 |
| Not a money maker, but have to carry fertilizer to compete with other businesses | 15 |

Fertilizer was considered to be a money-maker in itself by only about a fourth of the dealers—and those tended to be the dealers with the highest fertilizer mark-ups. The dealers who think of fertilizer as an important service to bring in business also tend to use more than an average amount of fertilizer merchandising techniques. In fact, they tend to use more fertilizer merchandising techniques than the dealers who consider fertilizer a good money maker in itself. The dealers said fertilizer was an important service to bring in business tended to operate larger than average businesses in which fertilizer was expected to both: (1) play a complementary role with respect to other lines of merchandise, and (2) "pay its own way" (the fertilizer mark-ups in these businesses was somewhat above the 9.3 percent all-dealer average). Thus, these dealers apparently feel that the fertilizer-related services they offer will keep their customers happy, and that their higher fertilizer mark-up will allow them to make an adequate fertilizer profit despite the cost of the services.

The remaining 41 percent of the dealers tended to either think of fertilizer as just another customer service or something they have to carry because they're expected to. These perceptions of their fertilizer business tends to relate to the extent to which the dealer aggressively merchandises fertilizer.

The role the dealers assign to fertilizer in their businesses appears to relate to the reasons they offer the fertilizer services they do. Asked why they offered the fertilizer services they did, the dealers answered:

| Responses | Percent |
|---|---|
| Profit | 19 |
| Complementary (brings in business; helps my business) | 36 |
| A service demanded by my customers | 20 |
| Good for farmers | 14 |
| Other | 10 |

It appears that much of the dealers' hesitance about offering additional fertilizer-related services, or in using their present services more intensively, seems to stem from the belief that they cannot make money selling fertilizer. However, the data seem to suggest that the opposite is

true. The dealer probably cannot make a great deal of money from fertilizer without using the appropriate fertilizer merchandising techniques.

Thus, it might seem that the major factor limiting the services offered by fertilizer dealers is their lack of knowledge about these techniques' effectiveness. Those dealers who know about and are using these fertilizer merchandising techniques are selling disproportionately large amounts of the fertilizer sold and are realizing an adequate profit while doing so.

For example, the dealers were asked to respond to an item beginning "The fertilizer business is . . . ". High relationships were found between the use of fertilizer merchandising techniques, fertilizer profits, and satisfaction with their fertilizer business. This information is presented below.

The 7 percent of the dealers who said fertilizer was a **sideline to their business:**

1. offered fewer total services and fewer of any type of services and promotional activities than any other group; the one exception being that they offered more credit than any other group.
2. had average fertilizer sales of $17,442.
3. had average fertilizer mark-ups of 6.9 percent.

The 31 percent who said the fertilizer business was **poor:**

1. offered relatively few services and promotional activities.
2. had average fertilizer sales volumes of $23,520.
3. had average fertilizer mark-ups of 9.0 percent.
4. said the low profit margin kept them from pushing fertilizer harder.
5. considered fertilizer as just another customer service, or not as a money maker but that they needed it to compete.

The 23 percent of the dealers who thought the fertilizer business was **average:**

1. offered relatively few total services and promotional activities but more than the group that said the fertilizer business was "poor" or was a "sideline."
2. offered more price discounting than any other group.
3. offered more than an average amount of spreading services.
4. had average fertilizer sales of $56,125.
5. had average fertilizer mark-ups of 8.9 percent.
6. sold fertilizer because it was a money maker in itself or because they considered it an important service to bring in customers.

The 5 percent of the dealers who said fertilizer was **a business with much potential:**

1. offered more total services and promotional activities than any of the other groups; the exception to this was price discounting of which they offered less than any other group.
2. had average fertilizer sales of $37,348.
3. had average fertilizer mark-ups of 12.7 percent.

The 22 percent of the dealers who said the fertilizer business was **excellent:**

1. offered about an average number of services and promotional activities.
2. offered more soil sampling and related services than any group except the one whose members said the fertilizer business had a great potential.
3. offered more than an average amount of educational services.
4. offered about an average amount of spreading services.
5. offered slightly more than an average amount of price discounting.
6. offered relatively little credit.
7. had average fertilizer sales of $86,091.
8. had average fertilizer mark-ups of 10.2 percent.
9. sold fertilizer because they considered it to be a good money maker in itself, or because it was an important service to bring in customers.

Thus, in general the groups that thought the fertilizer business was good tended to:

1. offer more fertilizer merchandising techniques than any other group, especially spreading, educational techniques, and soil sampling and testing.
2. have higher fertilizer mark-ups and, in general, larger fertilizer sales volumes.
3. consider fertilizer either as a good money maker in itself, or an important service to bring in customers.

At least some of the dealers would probably offer additional fertilizer services if they were given additional help by the fertilizer manufacturer or distributor. In the 118 dealer study:

1. slightly over half of the dealers said they were receiving no help from fertilizer manufacturers or distributors in their fertilizer merchandising programs.
2. 25 percent said they were obtaining help with advertising.
3. 10 percent said they were getting help with financing of customers' fertilizer purchases.
4. 5 percent said they were receiving help with the actual selling of fertilizer.

The dealers were then asked what suggestions they had for the people from whom they purchased their fertilizer.

Of the 48 percent of the dealers who had suggestions (20 percent had none; 32 percent considered the present services adequate), only 8 percent suggested price-related changes. Four times as many of the dealers making recommendations suggested either that the manufacturers should provide them with more information about the product, or that the manufacturer should make product changes of various kinds.

These data seem to indicate that most dealers were satisfied with the manufacturers' price policies. Since in answering other questions many of the dealers named price cutting as a serious problem, it appears that the dealers themselves may be instituting price competition as a basis for selling fertilizer.

It is obvious that fertilizer merchandising techniques do pay in increased fertilizer sales — and the dealer can maintain a better markup while increasing his sales by offering these services to his customers. The fertilizer industry has a large stake in these increased sales. The least help the industry can give to the fertilizer dealer is to inform him of these fertilizer merchandising techniques, effectiveness and data gathered from the 118 dealers indicates that the fertilizer industry might be the group best equipped to perform this dealer educational role.

The dealers do want this information—75 percent of the 118 dealers said they wanted more information about new fertilizer merchandising techniques. Most said they preferred to get this information from commercial sources, with the state agricultural college the second most popular source.

This is substantiated by the dealers' present use of information sources. When the 118 dealers were asked to rank the information sources most useful to them, commercial sources were mentioned most frequently. Within this commercial group fertilizer salesmen ranked highest, followed by fertilizer company publications, fertilizer manufacturer representatives and fertilizer company publications. Governmental sources such as agricultural colleges came in second.


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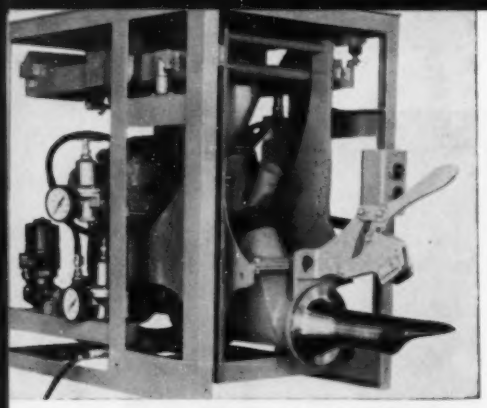
# FREE LITERATURE ON EQUIPMENT MATERIALS AND SUPPLIES



## New 25-50 Lb. Valve Packer

A new, compact and low-cost multiwall valve bag packer, designed for easy installation and excellent weight accuracy, has been introduced by St. Regis Paper Company. Two models are available: the Easiflow-1 for granular free-flowing materials, and the Easiflow-II for powdered dusty materials.

These versatile screw packers provide accurate weighing, high production, low headroom requirements, uniform product flow and an easy and dust-free operation.

The packers are designed for the filling of 25-lb. to 50-lb. bags. Up to four bags per minute can be packed on either machine, depending on product characteristics and density.

Excellent weight accuracy is provided by a quick acting cut-off mechanism and complete and automatic screw cleanout at each charge. Poise weight adjustments are within easy reach of the operator.

Installation of either packer requires minimum headroom because the packer is bin-mounted, and is installed simply by attaching it to the bin with eight cap screws, and connecting it to electrical and air sources.

Because of their simple design, all parts of both packers are readily accessible for service or adjustment. The filling screw is specially designed for easy and fast replacement.

The product being packed in the Easiflow-II (for powdered materials) is completely enclosed as it flows from the machine's hopper to the filling screw, assuring a dust-free operation.

For detailed information, circle Number 1 on CF's Information Service card, page 39.

## Spectrophotometer Accessories

A new accessories bulletin for Beckman DK Spectrophotometers has been published by the Scientific and Process Instruments Division of Beckman Instruments, Inc.

Accessories described in the brochure have been precision engineered to adapt DK Spectrophotometers to the requirements of such analyses as flame photometry, fluorometry, reflectrometry, spectroradiometry, colorimetry, solid phase studies, reaction rate studies, and turbidity observations.

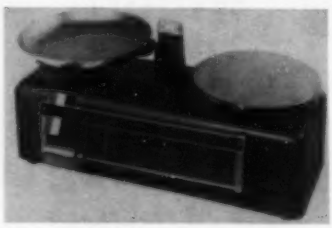
For a copy of Beckman Bulletin 738, entitled "Beckman DK Spectrophotometer Accessories," circle No. 2 on CF's Information Service card, page 39.

## Laboratory Balance

High capacity (up to 6 kilograms), high sensitivity (0.1 gram), and a very sturdy all-aluminum case are the features of a new line of multipurpose laboratory balances announced by Henry Troemner, Inc.

Two models are offered: 195-B has a sensitivity of 0.1 g., capacity of 3 kg. (7 lb.), tare capacity of ¾ lb., beam graduated to 100 g., 50 g., or 8 oz. Model 2-89B has capacity of 6 kg. with beam graduated to 500 g., 100 g., or 16 oz.

Both models are set in a heavy aluminum case with chemical-resistant blue-gray finish. Both have an



easy-reading angled pointed in a protective tower, stainless steel pans or plates, and a tare beam for simplifying measurement of net contents of containers. Dimensions: 16¾" long, 6⅛" wide, 8" high. For complete specifications and prices, circle Number 3 on CF's Information Service card, page 39.

## Flow Indicators, Alarms

New Bulletin 132, now ready for distribution, describes the Brooks Instrument Company flow rate measurement meters designed to operate at pressures up to 1500 psig. These are available in ½", 1" and 1½" sizes to handle flow in ranges from a minimum of 1.5 GPH to 50GPM.

Copies are available by circling number 4 on CF's Information Service card, page 39.


## One-Man Electric Car

A new one-battery electric car that seats one man and his equipment has been introduced by the Birdie Company for in-plant transportation. It weighs only 181 pounds, has a low center of gravity, a safe speed limit of 4½ miles per hour and operates with accelerator and foot brake. It is just 35" wide, narrow enough to go through tight aisles.

The Birdie car is suggested for plant executives, supervisors, maintenance men, messengers, spot checkers and other personnel required to move regularly from one place to another within a plant, warehouse, or between buildings.

A big heavy-duty battery powers the Birdie car for 10 miles. Each car contains its own charger and can be recharged overnight. No special wiring is necessary, as it plugs in any outlet.

The Birdie car is driven by a single rear wheel, eliminating heavy transmissions and differentials; there are relatively few parts to maintain. The car has a direct belt and chain drive for complete control.

The car costs $395: fleet discounts are available. It can be drop shipped anywhere in the United States.

For complete information on the Birdie electric car, circle number 5 on CF's Information Service card, page 39.

## Processing Equipment Catalog

A two-color, four-page illustrated condensed catalog of materials handling and processing equipment has been announced by Young Machinery Company. Designed to provide a quick but comprehensive view of Young Transvair pneumatic systems and Robinson unit machines, bulletin 102 is extremely handy for reference purposes.

Shown and described are Transvair pneumatic conveying systems and components such as pumps, blowers, feeders and cyclones; horizontal mixers; knife cutters; saw tooth crushers; gyro sifters; attrition mills; hammer mills; and pulverizers.

For your copy, circle Number 6 on CF's Information Service card, page 39.

### Trailer-Type Spreader

A new trailer type fertilizer spreader designed to haul and spread fertilizer up to 90 acres an hour has just been placed on the market by Continental Sales Company. The machine's hopper dimensions are 60 in. by 84 in. It will carry 2½ tons, and with 19 in. body extensions, 4 tons. Spread pattern is approximately 45 ft., and the machine can cover up to 90 acres per hour, depending upon field speeds of from 6 mph to 18 mph.

The four-wheel spreader, which is manufactured by Tyler Manufacturing Co., may be towed on the highway at speeds up to 60 mph. Other features noted by the makers include 14 gauge welded steel body; wheel driven conveyor (no clutches, shift tractor gears on the go); accurate metering adjustment; angled twin distributor for widespread performance (no interference from corn stalks or tall stubble; sealed ball bearing; galvanized steel conveyor belts; V-belt drive.

A free brochure describing the Tyler Spreader can be obtained from Continental Fertilizer Company by circling Number 7 on CF's Information Service card, page 39. Dealers interested in the spreader are also asked to write for information.

### Screw Feeding Data

Over 400 different dry materials used on their Screw Feeders are listed in an 8-page data folder issued by Vibra Screw Feeders, Inc. Listed also are the names of the companies supplying the material, and data concerning the material density, type and size of screw used, maximum rate in pounds per minute, and minute-to-minute accuracy of the operation.

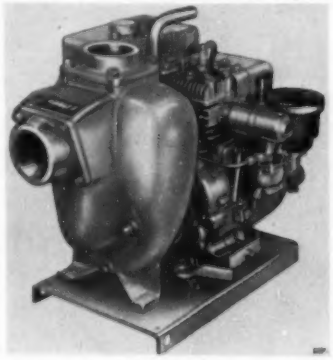
Issued as a guide to engineers responsible for process design and machine performance, the data is a result of thorough sampling and testing procedures. It offers a dependably accurate reflection of performance which can be expected from specific materials of known density handled by Vibra Screw Feeders in actual operation, and serves as a handy tool for forecasting results while still in the planning stage.

For free copy of this folder, circle Number 8 on CF's Information Service card, page 39.

### Nitrogen Solutions Pump

A new pump for nitrogen solutions, made entirely of aluminum with stainless fittings, in 1½" and 2" sizes, is now being manufactured by the Marine Products Company.

Having capacities of 100 and 140 GPM, the new MP pumps incorporate such features as flanges on both suction and discharge, an opening between the engine and the pump



to prevent solutions from contacting the engine, and, interchangeable parts on the 1½" and 2" models. In addition, the MP pump is entirely self-priming, with a built-in check valve to prevent siphoning. It is fitted with stainless steel studs, nuts, lockwashers, and shaft of stainless steel with ceramic seal.

'Flomax' all-aluminum nitrogen solution pumps are stocked and serviced throughout the United States and Canada at over 50 warehousing points with over 450 authorized MP service points.

For complete information, circle Number 9 on CF's Inormation Service card, page 39.

### Palletless Bag Handling

A new fork truck attachment for the palletless handling of bagged goods has been announced by the Industrial Truck Division, Clark Equipment Company.

The new attachment consists of two scoop-shaped arms which are hydraulically actuated to clamp bags. A side shifting mechanism is also incorporated to speed pick-up and place-down of loads.

Scoop arms are 45 in. long and can be spread 67 in. wide or clamped to 17 in. Arm slides are fully bushed to insure long, trouble-free operation. Maximum side shift of clamps is 25 in. (12½ in. each side from centerline when clamp opening is 42 inches.

The attachment has a maximum capacity of 3500 lbs. and is designed to fit all Clark fork trucks.

For additional information, circle Number 10 on CF's Information Service card, page 39.

### Minute-Sample Analysis

Analysis of samples, 20 microliters or less in size, is routine with the new Coleman Ultramicro Analytical Program. Originally designed for clinical analysis, the Coleman system permits accurate analysis of minute samples on the Coleman Junior Spectrophotometer The system is precise, dependable and economical. Key to the program is a special self-emptying ultramicro cuvette, which requires only 100 microliters of sample solution but provides a full 1.00 cm light path for the spectrophotometer beam.

For additional information, circle number 11 on CF's Information Service card, page 39.

### Electronic Moisture Register

The new G-6 Moisture Register—claimed by Moisture Register Company to be the fastest moisture test available on many granular, ground, powdered, loose, or shredded materials—is a compact refinement of the older G-5 Meter with practical accuracy to 0%.

The G-6 can be used anywhere, they say, saving laboratory and production time and requiring only one minute per test and no special skill or training for completely accurate work. It employs high hydraulic pressure to assure an homogenous sample and is already calibrated for many materials such as ammonium nitrate, ammonium sulphate, sulphur, calcium carbonate, etc.

For full information, circle Number 12 on CF's Information Service card, page 39.

### Tank Cleaner Bulletin

Bulletin 444, announced by Sellers Injector Corp., describes the company's new heavy-duty Model H tank cleaner. This is a light-weight, compact water-driven unit that scrubs tanks quickly and economically.

The four-page bulletin describes advantages of the Model H in cleaning stationary and mobile tanks in marine and industrial applications. Specific applications are listed and illustrated.

Photographs show dimensions of the unit and its working positions: on a collapsible stand, or suspended from the end of a supply hose.

A diagram shows typical cleaning arrangement for large tanks. Construction features are illustrated in a cross-section view which also lists all part numbers.

Specifications such as liquid pressures, total capacity in gallons per hour and nozzle revolutions per minute are listed tabularly.

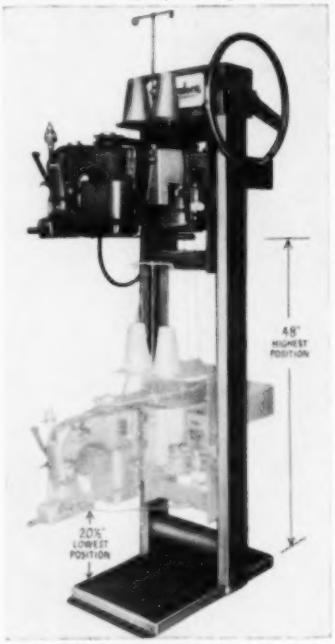
Copies of Bulletin 444 are available by circling Number 13 on CF's Information Service card, page 39.

### Adjustable Sewing Pedestal

A new sewing pedestal by Richardson Scale Company will adjust vertically and horizontally to suit various bag heights and widths, different sewing heads, filter cords and tape sealers, effectively eliminating need for a two-headed pedestal in bag-filling applications.

The new pedestal has a wide range of adjustments to accommodate sewing needs. Vertically, the height of the needle can be varied from 20½ inches minimum to 48 inches maximum. The horizontal adjustment ranges from 19 inches to 27 inches.

Raising and lowering the sewing head is accomplished by turning a




hand wheel operating a stainless steel cable through a positive ratchet for raising, and through a clutch for lowering the assembly. The head can be positioned exactly where needed, with zero backlash. It uses no counterbalance weights or springs.

The horizontal slide which supports the motor is adjustable in or out to allow for centering the needle of the sewing machine over the bag, depending on the width or fill of the bag.

The initiator is mounted on the horizontal slide, and not attached to the sewing head. This feature makes it usable with various heads.

Equipped for regular thread cones, the horizontal slide can be furnished with auxiliary mounting bracket for filter thread—either left or right side. The horizontal slide will also accommodate "jumbo" thread cones (20-pound size). Tape reels and supports are available for tape sealing heads.

For more information, circle Number 14 on CF's Information Service card, page 39.

### Parallel Shaft Speed Reducers

"Parallel Shaft Speed Reducers" is a new 36-page book that describes Link-Belt's completely redesigned and expanded line of "balanced design" parallel shaft reducers in 57 sizes, including 23 new sizes. Single, double and triple reduction units are available in capacities up to 2,800 h.p. at high or low output speeds, and ratios up to 292:1.

Book 2719 describes the complete line and includes full information for selecting the correct drive for every application. Sixteen pages of rating tables contain thermal and mechanical horsepower ratings for each input and output speed. Load classes are shown for almost 250 driven machines. Overhung loads, extended shafts and outboard bearings, dimensions and actual ratios are included in additional tables.

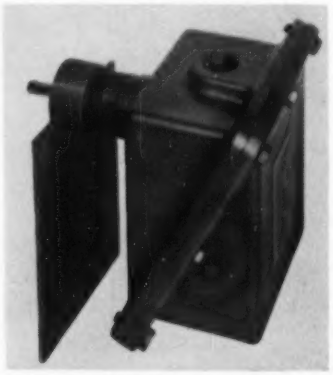
A copy of Book 2719 is available free by circling Number 15 on CF's Information Service card, page 39.

### Shaft Rotation Detector

An electronic watchdog, that automatically stops rotating equipment whenever excessive speed variation occurs, was introduced today by Flo-tronics Incorporated, Electronics Control Division.

Called 'Flo-Motion®' Shaft Rotation Detector, it comes in two models, the M300 and the M301.

The FLO-MOTION Model M300 permits a relatively wide variation



in shaft speed before signalling stoppage or slowdown.

The Model M301 is used where shaft speed must be closely watched. Range of speed-variation detection may be custom ordered to suit the application.

The electronic detectors can be used on all types of conveyors, rotating kilns, mills, driers and other processing equipment. For complete details, circle Number 16 on CF's Information Service card, page 39.



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### Rotodip Liquid Feeder

A new bulletin provides the most recent information on the Omega 'Rotodip' Liquid Feeder, manufactured by B-I-F Industries.

The bulletin gives a detailed description of the feeder and its operation, including a list of typical materials handled, a schematic drawing of a dry-materials-to-liquids proportioning process, as well as principal dimensions of the Rotodip.

For a free copy of Ref. No. 0065-20-1, circle number 17 on CF's Information Service card, page 39.

### Check-Weighing Systems

A new bulletin on check-weighing systems has been published by Weighing & Controls, Inc. The systems covered in the bulletin can be applied to all types of dry or liquid, single- or multi-unit containers to provide a continuous check on the filling accuracy of packaging equipment.

Bulletin 50, 'Unitized Check-Weighing Systems,' covers the various types of systems that can be assembled from a variety of platform scales, readout equipment and control instrumentation manufactured by Weighing & Controls. These systems are manual or automatic in operation, as required.

The simplest system, set up to reject packages on the basis of a single plus-or-minus weight tolerance, consists of a platform scale and remotely-located readout unit. In contrast to this, there is a multi-function system comprised of a weighing scale and appropriate control instrumentation. This system categorizes off-weight condition according to specific weight zones, and produces a transducer signal that can be used to indicate, record and/or totalize weight and thru-put data. The signal also can be used for automatic segregation of the reject packages, and regulation of the packaging or filling machinery.

Copies are available by circling Number 18 on CF's Information Service card, page 39.

### Screw Conveyor Drives

Link-Belt Company's new standard double reduction shaft-mounted speed reducer drive for direct application to screw conveyors is the subject of a new 4-page Folder 2718, 'Type B Screw Conveyor Drive.' This speed reducer is available in six sizes with ratios of 15:1, 20:1, and 24:1 for motors up to 30 h.p. It is equipped with a removable steel shaft and a cast iron adapter, which contains the shaft seals, for mounting on the conveyor trough end.

Features include: trough supported motor base with jack screws, adapter bolted trough end, positive seal protection in adapter and reducer, precision gears and bearings. Splash lubricated, the drive has a built-in baffle system for added protection against oil reaching material in conveyor and vice-versa.

Folder 2718 lists the sizes available in relation to screw diameters and gives selection data. A copy can be had free by circling number 19 on CF's Information Service card, page 39.

### Rotating-disc Pelletizer

A new four-page bulletin describing the company's standard line of rotating discs for pelletizing or mixing such materials as ore fines, phosphates, ceramic clays, fly ash and oxides has been published by Dravo Corporation.

Bulletin No. 247, "Dravo Pelletizing and Mixing Discs," cites design features and advantages of the Dravo discs, which range in diameter from 39 inches to 16 feet 5 inches and lists typical capacities.

Stressed are: the classifying action of the disc in producing pellets of uniform size; the high output of the disc through continuous operation; the easy adjustability of plows, pan angle, and rotating speed; the high quality of pellets produced; the infrequent necessity for binders; and the low overall cost per ton of output.

Dravo's plan for rental of the 39-inch discs for research and pilot plant studies also is noted.

Copies of Bulletin No. 247 may be obtained by circling Number 20 on CF's Information Service card, page 39.

### 'Panelcoil' Heating and Cooling

New Data Sheets M12 and M13 illustrate the uses of Dean single and double embossed 'Panelcoil' for heating and cooling, illustrated in their many extended applications on storage and processing tanks, drums, troughs and other processing equipment requiring heating or cooling.

These applications are unlimited in variety of shape, size and assembly to fit specific conditions. Demand for Panelcoil, as a replacement of pipe coil or jacketing, indicates the economy and efficiency of this method of heat transfer in industrial heating or cooling.

For copies of M12 and M13, circle Number 21 on CF's Information Service card, page 39.

### New USG Bulletin

Pressure gauges, thermometers and control instruments are described in Bulletin 3020 offered by U. S. Gauge, Division of American Machine and Metals, Inc.

Pressure gauges described in the comprehensive six-page bulletin are the bourdon-tube type covering a wide variety of industrial applications. Photographs illustrate each of the ten types covered, with information on dimensions, accuracies, construction features and suggested uses given in the text.

Included under temperature measurement are dial and glass tube thermometers, panel type and multi-angle thermometers. Photographs illustrate the different models with text covering information on construction, dimensions, ranges and typical applications.

Control instruments included are indicating controllers, valve positioner and pilot options, recorders, chemical attachments and accessories.

Copies of Bulletin 3020 are available by circling number 22 on CF's Information Service card, page 39.

### Liquid Applicator

A new pull-type fertilizer applicator for non-pressure nitrogen or complete liquid mix fertilizers is being built by Schelm Brothers, Inc.

The applicator has no pump or air compressor to maintain. Rate of flow is accurately maintained regardless of material level in tank. Application rates range from 5# to over 7500# total weight of material per acre—or any amount in between, at travel speeds up to 15 mph.

Available with PVC plastic booms in 18, 24 and 33 ft. lengths as well as Schelm's standard 5-knife tool bar for sub-soil application. Nozzles are on 12" centers and provide either full-coverage application or band application. Complete set of discs supplied with each unit.

Further information and prices on the Model "G" Applicator are available by circling Number 23 on CF's Information Service card, page 39.

### Vane Feeder Valve

A new bulletin giving complete information on a new line of heavy duty, pressure tight, rotary vane feeder valves is announced by Sprout-Waldron & Company, Inc.

The new line of feeder valves is designed to close tolerance fits to handle 25 psig internal pressure and high vacuum, and to seal against a differential pressure of 15 psig across the rotary element.

To request Bulletin 227 circle Number 24 on CF's Information Service card, page 39.

### Steel Efficiency Building

A new multi-purpose pre-fabricated steel building, the Spartan, has been developed by Martin Steel Corporation for industrial use and is said to be particularly valuable for the chemical field. A wide variety of sizes is available to fit individual needs.

Planned to conform to most building codes, the Spartan is available in a standard wind and roof load (12-pound snow load and 15-pound wind load) as well as a heavier model with a 30-pound snow load and a 20-pound wind load. The low-pitched roof design enables greater widths.

The Spartan is available in widths of 12 ft. multiples, enabling buildings up to 72 ft. wide. Lengths start at 32 ft., coming in multiples of 16 ft., to give any desired length. There are three basic heights: 10, 12 and 14 ft.

For a copy of booklet OSP-0301, circle Number 25 on CF's Information Service card, page 39.

# INDUSTRY PEOPLE

### Ashcraft-Wilkinson

George S. Carter will represent Ashcraft-Wilkinson Company, fertilizer materials sales organization, in Iowa and adjoining states, it was announced by George W. McCarty, chairman of the firm.

*Carter*

Mr. Carter joined Ashcraft-Wilkinson in May as a sales trainee. He is a graduate of the University of Missouri, with B.S. and M.S. degrees in soils. He will reside in Des Moines and work out of the company's office there.

### Ortho Division

Along with its plans to build a 22 million dollar fertilizer plant in Fort Madison, Iowa, California Chemical's Ortho Division (formerly California Spray-Chemical) recently announced the appointment of Dr. Leo C. Orth as fertilizer sales manager for the Northern region of the Eastern United States. Dr. Orth has been at their head office in Richmond, California, preparing plans for the firm's entry into Eastern fertilizer sales. As the new Fort Madison plant nears its completion date in 1962, Dr. Orth's policies and plans for the new sales area will be completed and ready for execution by production time.

### Freeport Sulphur

Maurice F. Dufour, vice president, has been appointed director of research and development for Freeport Sulphur Company, it was announced by Langbourne M. Williams, chairman of the board.

He will be responsible for research and development activities in all of Freeport's fields of interest, including operations and new enterprises.

Mr. Dufour is also executive vice president and a director of Freeport Nickel Company, a Freeport subsidiary whose nickel-cobalt mining and concentrating facilities in Cuba were seized last August by the Cuban Government. He had directed the construction of this $119,000,000 project which included a nickel-cobalt refinery at Port Nickel, Louisiana.

### Sulphur Institute

Dr. Marion D. Barnes has been appointed to the position of Industrial Research Director of the recently formed Sulphur Institute in Washington, D. C.

*Barnes*

The Institute, supported by basic producers of sulphur and pyrites, will conduct a world-wide research program on the uses of sulphur in all its forms by working through those private companies and public institutions best qualified to do the job. Dr. Barnes will have responsibility for planning, initiating and pursuing research projects in the industrial field.

Dr. Barnes, formerly Assistant Research Director with Monsanto Chemical Company's Inorganic Division, received his Ph. D. in Physical Chemistry from Columbia University in 1943 and has had extensive experience in teaching and research.

### Virginia Carolina

Justin Potter remains as president of Virginia-Carolina Chemical, despite an effort at the recent stockholders meeting to have him voted out of office. The meeting overwhelmingly approved his management.

### Consumers Co-op

Two appointments have been made by Consumers Cooperative Association at Kansas City, Mo. Warren Dewlen, who for six years has headed the ammonium nitrate department, has been named director of the fertilizer division. He succeeds Alvin H. Stephenson who has accepted the newly-created position of director of merchandise administration.

### Velsicol

Velsicol Chemical Corporation has announced the appointments of H. Duane Holsapple and Glenn R. Grosch as sales representatives for the agricultural chemicals division. The new appointments enable Velsicol to provide additional sales and technical service to customers in the Midwest.

### A P & C

Peter Colefax, president of American Potash & Chemical Corporation, has been named by the directors to fill the position of chairman of the board. He also will continue as president in which capacity he has served since February 21, 1947.

*Colefax*

E. M. "Ed" Kolb, assistant to the vice president of marketing, retired effective Oct. 1 and will continue with the firm for one year as a consultant. He joined them in 1932.

### Prosser

Robert J. Day joined Joseph L. Prosser Co., Inc., Glenarm, Md., according to word from Mr. Prosser. With the title of secretary, he will divide his time between office and the field, where he will supervise some installations.

Mr. Day has been in the plant food industry since his World War II service ended, and in his younger days he was a scale man, mixing and shipping foreman, and for the past twelve years has been construction supervisor and project manager in the industry.

### Swift

A. H. Phillips, formerly with Swift & Co. in the Virginia territory, has been made manager of their Norfolk operation, which both manufactures and sells farm fertilizers, pesticides and home gardening supplies in that region.

### IMC

Albert A. Guffey has been supervisor of chemical development at International Minerals & Chemical Corporation's experiment station at Mulberry, Fla.

He will be responsible for the chemical engineering and pilot plant activities undertaken at the experiment station, according to Lewis Barry, manager of the station. Mr. Guffey was production superintendent at the Bonnie, Fla., phosphate chemicals plant before his transfer. A 10-year veteran with IMC, he had been on the staff of the Bonnie plant for the last seven years.

### NPFI

As we reported here last month, Dr. James M. Brown has been named NPFI district representative for Alabama, Mississippi and Tennessee. He will make his headquarters in Auburn, not too far from his birthplace, a farm near Clayton, Alabama.

*Brown*

Dr. Brown has a distinguished record in education: Bachelor of Science from Auburn, then Alabama Poly; his Master of Science in Agronomy under an American Potash Institute assistantship; and his Doctorate in Soils from North Carolina State just this year.

### Mississippi Chemical

Owen Cooper, long executive vice president of Mississippi Chemical Corporation, Yazoo City, and active in its management since the establishment of the big cooperative fertilizer operation, has been advanced to president, succeeding Charles S. Whittington, who has held that office for ten years. Owen Cooper is also president of Coastal Chemical at Pascagoula, which he also helped establish. He is board chairman of First Mississippi Corporation and First Security Life Insurance Company.

### Meissner Engineers

James R. Colvin has joined the staff of Meissner Engineers, Inc., Chicago, as chief process engineer.

*Colvin*

A member of the American Chemical Society since 1939, and also of the National Association of Corrosion Engineers, Mr. Colvin formerly held chief process engineer and director of engineering and research positions with Olin Mathieson Chemical Corp. and Central Farmers Fertilizer Co. Prior to this time, he was a consulting engineer with H. K. Ferguson Co. on a number of chemical, food processing, and petroleum projects in the South and Southwest.

At Meissner Engineers, Mr. Colvin will be in charge of process engineering for Meissner's clients in the chemical and related industrial fields.

### U. S. Borax

Appointment of W. L. Klatt as assistant to the director of agricultural chemical sales for United States Borax & Chemical Corporation is announced by J. F. Corkill, vice president in charge of marketing.

*Klatt*

A graduate of the University of Nebraska, Mr. Klatt served as state weed supervisor for Nebraska and for South Dakota before joining U. S. Borax in 1949 as a sales representative.

Appointment of Randall L. Woods as editor of the "Pioneer," employee publication of United States Borax is announced by President James M. Gerstley.

A journalism graduate of Trinity University in San Antonio, Texas, Mr. Woods joined U. S. Borax in 1959 as public relations assistant for the company's Carlsbad, New Mexico, mining operation.

### USDA Extension Service

Paul V. Kepner, deputy administrator of the Federal Extension Service of USDA since 1953, has been appointed administrator. He succeeds C. M. Ferguson who was named assistant secretary of agriculture when Ervin L. Peterson resigned September 16.

### Davison Chemical

New appointments in mixed fertilizer production and sales are announced by W. R. Grace & Company, Davison Chemical division.

George H. Reid, Jr., formerly administrative assistant to A. C. McCall, assistant general manager, mixed fertilizers, has been made manager of the Curtis Bay, Baltimore mixed fertilizer plant. The sales area of this operation extends into ten states in the northwestern section of the United States.

Harry E. Velker has been named manager of the Curtis Bay, Baltimore normal superphosphate plant. He succeeds Roy W. Biddle, recently named general chemical superintendent of Davison's Florida Phosphate Division.

H. N. Greenlay has been transferred from Baltimore to New England as sales manager for the New England territory.

W. N. Watmough, Jr., is vice president of the mixed fertilizer operations for Davison.

### Raymond Bag

A. W. Hines has been appointed to the position of vice president in charge of manufacturing, and a director of Raymond Bag Corporation, Middletown, Ohio, division of Albemarle Paper Manufacturing Company, Richmond, Virginia.

*Hines*

He received his education in Richmond, Virginia, and is also a graduate of American Management Association. He is a member of the Waterproof Paper Manufacturers Association Inc., and Paper Shipping Sack Manufacturers' Association, and various local organizations, including the Middletown Personnell Association, Civic Association, and Middletown Industrial Council.

Mr. Hines has had many years of experience in the paper industry, joining Albemarle Paper Manufacturing Company in 1930, and coming to Raymond in 1955 in the capacity of production manager.

He will be in charge of all phases of manufacturing in Raymond's Richmond, Virginia, and Middletown, Ohio, plants.

### Hudson Pulp & Paper

Howard Brody has been appointed product manager of Hudson Pulp & Paper Corp.'s multiwall division, it was announced by Benjamin Danziger, manager-administration and market planning of the division.

*Brody*

Mr. Brody, formerly assistant to the sales manager of the division has been associated with Hudson for three years where he has had a wide range of experience in the sales, marketing and technical problems of the multiwall industry.

In his new capacity, he will be responsible for keeping abreast of all developments in the multiwall field and for coordinating Hudson's continuing effort to find ways best to meet its customers' packaging needs. The company has three major multiwall facilities at Pine Bluff, Arkansas; Wellsburg, West Virginia and Palatka, Florida.

### Cotton Producers

*Burson*

*Nunnally*

J. E. Nunnally, director of plant food services for Cotton Producers Association, Atlanta announced his retirement effective September 1.

Connected with the fertilizer industry for 38 years, he joined Cotton Producers Association in the plant food department in September, 1945 and was named director of plant food services in 1952. He will continue to serve in an advisory capacity.

G. A. Burson was named CPA's director of plant food services succeeding Mr. Nunnally, C. W. Paris, assistant general manager of CPA announced.

Formerly director of plant food distribution, Mr. Burson joined the association in 1946, and later served as manager of the CPA fertilizer plant in Cordele before moving to the Atlanta office as director of plant food distribution in 1956.

### Beckman

Harry H. Bauer has been appointed Midwestern regional sales manager for the Scientific and Process Instruments division of Beckman Instruments, Inc., according to Robert A. Piper, Midwestern regional manager. Mr. Bauer will direct the division's field sales force in the Midwestern region.

Appointment of James E. Tebay as training manager has been announced by R. C. Erbes, customer relations manager.

In his new position, Mr. Tebay will be responsible for training dealers and customers in the use of instruments marketed by the division, as well as sales and service training of dealers and Beckman personnel.

### Miller

Robert C. Berry has been made salesmanager of the pesticide department of Miller Chemical & Fertilizer, Baltimore. He joined them in 1955, and is an entomologist.

### Tunnell

Arthur E. Dorval, effective September 1, was named salesmanager of the F. W. Tunnell & Co. fertilizer department, Philadelphia.

### Pacific Guano

Three appointments and one retirement were announced by Pacific Guano Co.:

W. L. Dixon, president and general manager, has been appointed executive vice president and general manager of the Pacific Chemical and Fertilizer Co., Honolulu. Howard Conley has been named vice president in charge of sales, and Jack Hollingshead has been promoted to vice president, purchasing and production, both with Pacific Guano at Berkeley, Calif.

Ralph Crum, vice president at Berkeley, has retired after 41 years' service. He will continue to be associated with the firm in an advisory capacity. Mr. Crum in 1919 joined the staff of the Hawaiian Fertilizer Company, which later became the Pacific Guano Co.

### Southern Nitrogen

*Forshee*

*Carpenter*

Horace Forshee has been named assistant director of sales-agricultural, by Southern Nitrogen Company. He will be primarily interested in the sales of all forms of direct application nitrogen and will work closely with the sales staff at the dealer and small manufacturer levels.

He joined Southeastern Liquid Fertilizer Company as district manager in 1951, and in 1958 went into the sales department of Southern Nitrogen.

John A. Carpenter has been appointed sales representative for Southern Nitrogen in the North Carolina sales area according to an announcement by company officials.

A native of Cherryville, N. C., Mr. Carpenter will handle the sale of direct application nitrogen in the "Tar Heel" State will have his headquarters in Dunn, N. C.

A 1957 graduate of North Carolina State College, Mr. Carpenter was sales representative for the Virginia-Carolina Chemical Company for two years, after which he became associated with Southern States Phosphate and Fertilizer Company of Savannah prior to joining Southern Nitrogen Company.

### Bemis

*Spencer*

*Robey*

Various managerial changes within the central operations of Bemis Bro. Bag Company were announced by T. H. Ashton, director of central operations:

S. M. Spencer has been appointed manager of the St. Louis bag plant and sales division, and S. D. Robey has been appointed manager of the Omaha plant and sales division.

Mr. Spencer replaces Philip C. McGrath, who has been with Bemis for over 47 years and has served as manager of the St. Louis plant and sales division since 1953. Until his retirement next January 31, Mr. McGrath will be a special assistant to the company's director of sales in the St. Louis general offices. Mr. Robey replaces Mr. Spencer at Omaha.

### Royster

Nido L. Hamilton has been appointed assistant sales manager of F. S. Royster Guano Company's Norfolk sales division, which covers portions of eastern North Carolina and eastern Virginia. He succeeds T. C. Dula who has been appointed sales manager of the Price Chemical Company division of F. S. Royster, Louisville, Ky. Royster recently acquired the Price firm, giving it distribution throughout Kentucky.

Royster has appointed Don R. Branch assistant sales manager of its Charlotte, N. C. sales office.

He was transferred from Royster's Jackson, Miss. sales office, where he was a sales representative in northeastern Mississippi.

Walter L. Demoise has been appointed sales representative in southeastern Pennsylvania for Royster. A new employee, Mr. Demoise will work out of Royster's Reading, Pa., sales office. He succeeds C. N. Bomberger.

Royster has appointed Ralph D. Johnson sales representative in northwestern Ohio, succeeding James V. Wilson.

### Cyanamid

The promotion of two key executives of American Cyanamid Company's agricultural division was announced by C. D. Siverd, divisional general manager.

Frank Cooper, formerly manager of services for the Cyanamid Agricultural Center, has been appointed division general services manager and will report to the general manager. Mr. Cooper joined Cyanamid in 1937.

Named to replace Mr. Cooper is R. P. Popino, who was plant manager for Cyanamid's Princeton plant. Mr. Popino's new title is manager, Agricultural Center services, reporting to the division general services manager. He joined them in 1945.

### Smith-Douglass

M. A. Glass, manager of the Smith-Douglass Albert Lea, Minn., plant, has announced the appointment of R. M. "Mike" Andersen as sales representative in northwest Iowa. He has been with Smith-Douglass Company since January 19, 1959.

Kermit J. Mosley became plant superintendent of the firm's facility in Holland, Mich. on October 1. He formerly was supervisor of the Norfolk, Va., pelletizing plant and has been with Smith-Douglass since 1955.

Dale W. Batchelor has been named a sales representative in the immediate area of the Holland plant.

### Hooker Chemical

Robert G. Thorn has joined the Phosphorus division of Hooker Chemical Corporation, as division traffic manager, a newly created position, it was announced by Robert E. Noble, general manager of the division.

Mr. Thorn is located in Jeffersonville, Ind., headquarters for the Division which has other plants at Adams, Mass., Columbia, Tenn., and Dallas, Texas, and also sales offices at Jeffersonville, Chicago, Ill., New York City, and Marysville, O.

### Warner W. Price

Mrs. Henrietta C. West has retired from Warner W. Price Co., Inc. of Smyrna, Del. after 35 years of service with the firm. Her retirement is effective October 10. She has been corporate secretary for the past 20 years.

Harry J. Lower, vice president and treasurer of the firm, retired from his post on June 30, after 42 years with the company.


## ARIZONA

**Sun-Ray Products, Inc.,** Phoenix, has been incorporated with $500,000 authorized capitalization to deal in chemical and organic fertilizers and insecticides, micro-organisms and by-products. Directors: R. A. Peters, Herbert E. Welhener and Raymond J. Beran, Phoenix; Donald G. Pass, Scottdale.

• • •

**Yuma Chemicals, Inc.,** Yuma, have established a $40,000 pesticide and defoliant plant. Both the founders are in the fertilizer business separately and will continue to be. They are Richard Jacoby of Jacoby and Sons, who is president; Jay Rathbun of Rathbun Chemicals. Manager will be Jay Curtis, who comes there from a similar operation in Salinas, California. The plant will be equipped to produce 6000 daily gallons of liquid and 50,000 pounds of dust mixtures.

## ARKANSAS

**Lion Oil** has put into production its 15 daily ton sulphur recovery facility at El Dorado, which will deliver molten sulphur to the Monsanto plant there, for sulphuric acid production. Lion is a division of Monsanto.

## CALIFORNIA

**California Spray Chemical** has completed plans for a new warehouse and branch office in Woodland. Provision has been made in the plans for liquid and bulk fertilizer storage and handling. Lamon Construction has the contract, with Alan Peter as Calspray's field engineer on the project. Total cost is estimated at $90,000.

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**Swift & Co.** has closed its Hayward plant and transferred operations to Los Angeles and Merced. The latter becomes the new HQ for Northern California.

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**Los Angeles** has halted production of sludge at its Hyperion sewage treatment plant and is dumping all material into the ocean.

The change in operation poses no pollution problem, but it renders obsolete about $7 million in equipment less than 10 years after it was put into service. It is more economical to do this than to continue production, according to Norman B. Hume, director of the Bureau of Sanitation.

By taking the new steps, the city will cut its costs per unit treated by at least 10%, according to estimates. The city was receiving $4 a ton for its daily production of 90 to 100 tons, while it estimated its cost to produce the sludge at $26 a ton; one of the problems was its low nitrogen content, making it only a soil conditioner.

Last spring the production techniques at Hyperion were changed and experiments were conducted with a different kind of sludge. In a trial run, fertilizer was produced with a nitrogen content of 7.5%, three times the previous content, making it a desirable product.

Officials of the Sanitation Bureau asked for $100,000 to make a six-month experiment with production of the new higher nitrogen fertilizer to see if it could be sold profitably. The proposal was vetoed in the mayor's office.

## FLORIDA

**Chemical Lime, Inc.,** Brooksville, which has a lease permitting it to mine Ocala's Camp Concrete Rock Co. limestone, is to build a $2,000,000 plant, now on the drawing boards at Dorr-Oliver—which is expected to be in operation by next Summer. It will use the Fluo-Solids system and is expected to be the most modern lime-burning plant in the U.S. With its 200 daily ton capacity, this plant will increase Florida's total lime production 500%. The lime produced—both quicklime and hydrated—will be used for manufacture of phosphates, insecticides, sprays and other products.

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**Ranch Fertilizer,** Okeechobee, which has been producing liquid fertilizer for four years is now also offering dry mixtures as the customer requires, mixed to his soil needs. The concern has its own transport and application equipment. Bob Matthews is manager.

## GEORGIA

**American Cyanamid** has just signed an agreement with the Georgia Ports Authority, which will build a $250,000 storage tank at Savannah, with Cyanamid guaranteeing 60,000 annual tons of molten sulphur to be shipped through this port. Engineers Dan E. Sewell & Associates expect the facility to be in operation by April 1.

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**International Minerals and Chemical Corporation** is constructing a new concrete and brick office building at its plant in Tifton.

The building will contain about 1,200 square feet of floor space. The cost was not disclosed. It will include two private offices, a bookkeeping area, and a store room for supplies. It is being placed slightly to the west of the old office building.

Hoyt Whitesides, plant superintendent, said the old structure will be moved out to provide more room for trucks. He said the new office was needed to provide additional space which is badly needed since the district sales headquarters was moved to Tifton. W. P. Burke is district sales manager.

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**C. O. Smith Guano Co.,** Moultrie, has installed a 20-foot scrubber which company officials say will materially alleviate fumes from the acid plant.

The scrubber, installed at a cost of $30,000, is located at the end of the manufacturing process. It was designed by E. M. Jones, chief engineer for the Tennessee Corporation, Copperhill, Tenn., an authority in this field.

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**McLeod's Fertilizers** has moved the railroad depot they purchased to the grounds of their fertilizer manufacturing plant in Tifton and turned it into an office and storage building.

McLeod's purchased the 20x50-foot building in Omega from the railroad after the tracks were removed and train service was discontinued to Omega.

The building has been painted white to match the McLeod plant, which was constructed and put into

use early in 1960. It was divided by partitions for office space, and for storage of nitrogen.

## IDAHO

**Bunker Hill** has begun construction of a plant at Kellogg, which is to cost $225,000 and is an addition to their present phosphoric acid plant there. This will be owned by Collier Carbon and Chemical, as is the anhydrous liquid phosphate to be made there, but delayed—as we reported here last month—by a minemill strike.

## ILLINOIS

**The National Phosphate Corporation** has announced that construction is 50 percent completed on the new phosphoric acid plant in Marseilles. The plant was designed by Chemical Construction Corporation, New York, and is designed to produce 54 percent $P_2O_5$ phosphoric acid by the "wet process," using Florida phosphate rock and 93-98 percent sulphuric acid.

Chemico is including the most advanced filtration and concentration equipment, especially developed for phosphoric acid operation, as well as special process features to allow a substantial reduction in water requirements and elimination of fluorine from plant effluents.

# Armour's $60,000,000 Expansion Includes New N&P Plants along with Modernization

A 60 million dollar expansion program for Armour Agricultural Chemical Company has been announced by William Wood Prince, president of Armour and Company. Greater part of the expansion program will involve the construction of new facilities for the production of phosphate and nitrogen, which will approximately triple Armour's current production of these materials during 1962. A nitrogen plant will be built near Sheffield, Alabama, and phosphate operations will be expanded in the Polk County, Florida area.

The products will enable Armour's fertilizer marketing division, currently the largest distributor of mixed fertilizers, to upgrade its products in the higher chemical analysis field, and enlarge its sale of straight fertilizer, Mr. Prince stated.

W. E. Shelburne, president of Armour Agricultural Chemical Company, which has its general offices at Atlanta, Ga., explained that the Sheffield plant will produce ammonia, nitric acid, urea, nitrogen solutions, ammonium nitrate, and other ammonia derivatives. Employing 200 to 250 persons, it will have a rated capacity of 360 tons of ammonia per day.

The other plant, in the vicinity of Ft. Meade, Florida, will extract and process phosphate rock and will produce phosphoric acid and triple superphosphate. The new phosphate plant will also manufacture sulphuric acid. Considerably larger than the company's present source of phosphate materials in Bartow, Florida, the new facility will process between 700,000 and 800,000 tons of phosphate rock per year, with employment of about 250 persons.

Construction of both plants is scheduled to start promptly and the company hopes to have them in production in 1962, Mr. Shelburne said.

Several other new plants are involved in the expansion program. They will be compact units designed for the production of liquid mixed fertilizers and bulk blended fertilizers, and will be located in the rural Middle West, serving customers within a 50-mile radius. Armour has already placed one plant of this type in operation at Centralia, Mo.

The company will also continue an extensive modernization program for existing fertilizer mixing plants. There are 27 of these plants located in the United States and one in Puerto Rico.

The U. S. plants are located in Albany, Augusta, and Columbus, Ga.; Baltimore, Md.; Birmingham and Montgomery, Ala.; Carteret, N. J.; Chicago Heights and East St. Louis, Ill.; Cincinnati and Sandusky, Ohio; Columbia, S. C.; Dallas and Houston, Texas; Davenport and Jacksonville, Fla.; Greensboro and Wilmington, N. C.; Jeffersonville, Ind.; Memphis and Nashville, Tenn.; New Orleans, La.; Norfolk, Va.; Kansas City, Mo.; Owosso, Mich.; Waterloo, Iowa, and Winona, Minn.

Armour Agricultural Chemical also has a nitrogen plant located at Crystal City, Mo., near St. Louis, purchased last year from Mississippi River Chemical Company.

## IOWA

**Ris-Van, Inc.** of Belmond has purchased the fertilizer and anhydrous ammonia plant owned by the Andrew Farm Store in Jefferson and will spend $140,000 expanding its facilities. It will have a daily capacity of 1,000 tons. Joe Triplett will be plant manager. Ris-Van also has fertilizer plants at Sanborn, West Union, Belmond and Vinton in Iowa and at Blue Earth and Willmar in Minnesota.

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**Twin States Engineering & Chemical,** Walcott liquid fertilizer mixer, has installed a 22,000 gallon tank for storage of direct application nitrogen solutions.

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**Alexander Enterprises** are constructing near Conrad a $20,000 remote-controlled dry fertilizer mixing plant producing 20 hourly tons. With their equipment, one man can mix any analysis in any desired quantity. 50 pound bags are filled on their equipment.

## MISSISSIPPI

**Southwest Potash Corp.** has begun construction of their $7,000,000 potassium nitrate plant at Vicksburg. Ground will be officially broken the 16th of this month according to president, Thomas W. Childs. Preliminary planning has been started on a $3-million expansion project at the Southwest Potash mine and mill near Carlsbad.

Company officials said the increased capacity is required to keep pace with expanding sales. The new facilities will also provide for further improvement of the firm's muriate product to meet advancing requirements.

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**Southern Materials of Mississippi, Inc.,** is building a $300,000 plant between Clinto and Raymond to produce agricultural lime.

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**Mississippi Chemical's** prilling tower at Yazoo City collapsed recently and will take several months to repair and rebuild. But meanwhile, production will remain between 75% and 90% of normal, according to Owen Cooper, president. The damage is estimated at $500,000.

## MISSOURI

**Farmer's Chemical** is building a $136,234 addition to their storage building at Joplin. Completion is due February 1. The addition will be 150 by 120 feet, steel with asbestos siding. Farmer's is owned

jointly by Missouri Farmers and Consumers Cooperative.

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**Solar Nitrogen Chemicals,** Lima, Ohio subsidiary of Atlas Powder and Standard Oil of Ohio has begun construction on the $15,000,000 plant it plans to put into operation by April of next year. Located east of Joplin, the facility will produce anhydrous ammonia and related products.

## NEBRASKA

**Consumers Cooperative** has announced plans for an $8,000,000 fertilizer plant at Hastings. R. R. Zurbuchen, general manager of the Lawrence, Kansas, operation will have charge of construction and operation of the Hastings unit, which is expected to be in operation about a year from now. With good local sources of natural gas, the plant is to produce 150 daily tons of anhydrous ammonia. The Lawrence plant, originally built to produce 180 daily tons, now is turning out 380 tons.

## OHIO

**Stadler Fertilizer Co.,** Cleveland, is introducing four lawn products, including a non-burning specialty mixed fertilizer with urea-formaldehyde nitrogen.

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**Stim-U-Plant Laboratories,** Columbus, is making its African violet plant food available in liquid form, in addition to the powdered form which has been on the market for some time. Both carry a 5-8-7 analysis.

## SOUTH CAROLINA

**Liberty Gin and Fertilizer Co.,** Liberty, was burglarized recently, and $400 taken from the safe, half of which was forced open. The other half would have yielded $1,000.

## TENNESSEE

**Mid-South Chemical** has announced the addition of a 9500-ton refrigerated, atmospheric pressure ammonia storage tank at Memphis and a pair of spherical storage vessels at North Pekin, Ill.

The new tanks, which will be in service by January 1, are part of a major expansion program which also has included launching of a new 1000-ton ammonia barge for use in the Mississippi River system and the Intracoastal Waterways. Also, the firm has announced completion of a new warehouse and office building at North Pekin, Ill.

Ellis T. Woolfolk, president of Mid-South Chemical Corporation, explained the additional storage would permit better stockpiling of ammonia. The concern distributes ammonia under the brand name Big N in 11 states—Texas, Louisiana, Alabama, Mississippi, Arkansas, Tennessee, Kentucky, Missouri, Illinois, Indiana and Iowa.

Mid-South is an affiliate of Cities Service Co. and Continental Oil Co., as is Petroleum Chemicals, Inc., manufacturer of the ammonia at Lake Charles, La.

Mid-South Chemical Corporation operates three other river-rail-highway terminals in addition to those at Memphis and North Pekin. These are at Harlingen, Texas, New Iberia, La., and Mt. Vernon, Ind.

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The **W. R. Grace & Co.** expansion project at Memphis is on schedule and it is expected that the new capacity will be on stream by Spring of 1961. The expansion will raise rated capacity 60% to 160,000 tons per year. It will insure adequate ammonia supplies for the urea plant, which was doubled last year to 100,000 tons per year, and help provide for growing industrial and agricultural demand for ammonia as well.

## UTAH

**Texas Gulf Sulphur** has completed a core drilling program to evaluate potash reserves obtained by the company from Delhi-Taylor Oil Corporation, located at Cane Creek in southeastern Utah near the town of Moab.

The drillings "fully confirm a very large potash deposit believed to be richer than any other known to exist in the United States," according to Claude O. Stephens, president of the big sulphur concern. Mr. Stephens stated he would "strongly recommend" that his directors authorize company diversification into potash, "if studies nearing completion yield final reports as favorable as all interim reports have been." Texas Gulf would plan to invest "from $20 million to $30 million" to construct facilities in Utah for producing commercial potash from the new source. Mr. Stephens added that, in thus diversifying, the company intends to use funds generated by its sulphur business, rather than borrowing from banks or other sources.

Market studies are being employed to determine what plant size will be consistent with optimum profits and return on investment. Based on studies to-date the company presently favors a plant with an approximate capacity of 10,000 tons of ore daily. Due to the richness of the Cane Creek ore, "this plant would produce more potash than any existing operation," according to Dr. C. F. Fogarty, Texas Gulf vice president. Several companies presently can produce more ore "but with less yield of potash," he stated.

## WYOMING

**Stauffer Chemical Co.** has reported the first concrete pour on the multi-million-dollar soda ash mine and plant near Green River. Winton & Co. is the prime contractor.

Stauffer also has called for bids on construction of a 10-mile railroad to connect the development with a Union Pacific line. Construction will include a bridge over the Green River.

## CANADA

**Electric Reduction Co.** of Canada Ltd. is building a $12,000,000 plant at Port Maitland, Ont., which will produce phosphates including large quantities of fertilizer ingredients to be sold in the United States.

Company, it is announced, has agreed with International Minerals and Chemical Corp., Skokie, Ill., that the Canadian products will be distributed in the United States by the U.S. firm. The plant would be able to supply the whole Canadian market and about five per cent of the United States market.

Electric Reduction also has an addition under way at its **Dominion Fertilizer Ltd.** normal superphosphate plant, located at Port Maitland. The firm acquired this facility last year.

## DENMARK

**Norsk Hydro-elektrisk Kvaelstofaktieseskab, Dansk Andelagodingsforrething** and **Akieselskabet Dansk Syavlsyre-og Supenhosphat-Fabrik** are setting up in Jutland a jointly controlled nitrogen plant to produce 75,000 annual tons of nitrates and 20,000 annual tons of liquid ammonia. The subsidiary will be known as Dansk-Norsk Kvaelstoffabrik I/S. The two Danish firms are putting in about $5,800,000 each, with Norsk Hydro adding $2,900,000. The plant, at Grenaa, is expected to be ready in 1963.

## HOLLAND

**Royal Dutch Shell** and **Royal Netherlands Blast Furnaces** are joint owners of Mekog, which will build

near Rotterdam a mixed fertilizer plant with a capacity of 160,000 annual tons. It is expected to be in operation by 1962. It will produce chiefly for export.

## INDIA

**The Government** has invited proposals for a fertilizer plant at Hanumangarh in Rajasthan to produce ammonium sulphate from the gypsum and lignite which are plentiful in this area.

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**Hindusthan Chemicals and Fertilizers Ltd. will** build an electric plant to serve the proposed 100,000 annual ton fertilizer plant at Namrup.

## NEW ZEALAND

**The Capital Issues Committee** has given consent to the formation of a 600,000 pound company to build a fertilizer works at Taumarere in North Aukland to begin operation in about three years. Existing fertilizer concerns are the principal stockholders.

## SOUTH AFRICA

**Sasol,** which has produced ammonium since 1955, will be ready by 1963 to turn out nitrogen for the manufacture of fertilizer. This will put to work the many tons of nitrogen gas and hydrogen which are by-products of the plant.

## SOUTHERN RHODESIA

**African Explosives and Chemical Industries** expect to have in production by 1965 the nitrogen plant for which plans and estimates are now complete. It is expected to cost $25,200,000, and will be located in Salisbury.

## UGANDA

**Uganda Development Corporation** plan to establish a fertilizer plant at Sukulu, near Tororo, has advanced to the point of capital cost report, which runs around $15,000,000 and should produce 25,000 annual tons of fertilizer at the beginning.

## UNITED ARAB REPUBLIC

**Suez Canal Authority** is planning additions to the fertilizer plant at Suez.

## VENEZUELA

**The Government Petrochemical Plant** will develop the large deposit of phosphate in the Lobatere region of Tachira.

# Producers Supply Expands, Modernizes Plant Operation

Producers Supply, Inc. has just completed a $100,000 expansion and remodeling program for its fertilizer plant, located at Palmetto, on the west coast of Florida near the southern tip of Tampa Bay.

The enlargement consists of a 60' x 200' structure added to the existing building. The addition was constructed with reinforced concrete floor, and a concrete platform extends along the rail side and the street end of the new section. The exterior platform, covered by a canopy, is nine feet wide and has a ramp at the end to facilitate handling materials to and from cars and trucks.

Walls of the new building are 20 feet high; the lower ten feet is reinforced concrete, and the upper ten feet is steel. An A-type clear-span steel roof tops the structure.

The new addition contains two elevators, one for unloading, the other for base mixing. Heart of the basing unit is a one-ton batch mixer with a nitrogen solutions sparger system. A 98-foot reversible shuttle-type overhead belt conveyor handles materials and base goods in distribution to storage bins. There are eight 10' x 45' materials storage bins and three 20' x 45' base goods storage bins in the new section, with space allowed for additional future bins.

A 55-foot superstructure houses the new cluster hopper system, consisting of 12 five-ton hoppers clustered over a one-ton weigh hopper and scale; a conveyor carries the assembled materials to the mixing elevator.

Engineering and layout on the new plant was done by Atlanta Utility Works, East Point, Ga.; the overhead conveyor, trackside elevators, mixer and related equipment were manufactured by Atlanta Utility. Allen G. Clements Company of Moultrie, Ga. fabricated and installed the cluster hopper unit. The solutions handling equipment was manufactured by J. M. Tull Metal and Supply Co., Atlanta, Ga. The new building was erected by Atlas Construction Company of Sarasota; this firm also assisted in installation of the equipment and machinery.

Taken during construction, this picture shows the hopper system in the process of fabrication.

Company officers state that the improvements—which were placed in service just last month—will make the facility one of the most efficient small plants in Florida. In the year ending June 30, the firm produced over 11,500 tons of mixed fertilizers.

Mixing and solutions equipment in the older portion of the plant remains intact for peak-period or emergency use.

J. E. B. Asbell is president of Producers Supply; Earl R. Frierson is vice president and treasurer; Mrs. J. E. B. Asbell is secretary. The company maintains a warehouse and distribution facilities also at Fort Myers, Fla.

This view from the railroad tracks shows new section of the plant, with 200-foot loading platform along the spur track, and 60-foot platform running along the street side. Nitrogen solutions storage tank is seen between platform and street.

*Startling statements heard at*

# Southeast Fertilizer Conference

One of the most startling, and certainly down-to-earth statements heard for many a moon in this industry was made at the Fifth Annual Southeastern Fertilizer Conference, on October 6, in Atlanta. The final speaker, and the briefest, of the panel on "What Does Agriculture Need?" was **Dr. R. Q. Parks** —talking on the industry responsibility for the future of agriculture.

In essence, Dr. Parks says that if we were all put on a commission basis, founded on the profit the farmer makes, the progress of agriculture would be mightily speeded up. It is a startling thought—but economists have long realized that in fact all of us, from preachers on down, are on a commission basis. But of Dr. Parks, more in the sequence report of the panel talks:

As you can see from the program, there were five speakers, presided over by **W. M. Campbell.** Let's take them in order:

**Commissioner Ballentine** says we need a public relations program "to change the emnity which surrounds the farmer." This emnity stems from the fact that the farmer is subsidized. People think nobody else is supported by the government. And they resent it.

People think that there's nothing to farming except muscle power—not realizing that a whole new form of agriculture has developed in recent years . . . a science of agriculture, which demands study and equipment and management such as no farm ever got a few years ago . . . a science so difficult to master that there is a serious social problem, as another speaker put it, created by the exodus of young people, unwilling to do so much preparation for so long for so poorly paid an occupation.

Agriculture — he said — is the threadbare poor relation, who cannot carry on very much longer on the present basis, and we may find ourselves worrying about food shortages, rather than surplus. Agriculture is a basic need in war or peace. You cannot turn it on or off at will. So something must be done about it; something that will rally public support to the needs of the farm; something that will keep the family farm alive,—and the farm family, too.

For, thinks the Commissioner, if we have fewer and fewer farmers on more and more acreage, some day we will have an economic bully, to create artificial shortages and command fabulous prices for food and other farm commodities. So, he believes, it is up to all of us to share the load of a public relations job that will let the family farm survive. Sharing the load, this would be no burden to anybody . . . and, says he, "It can be done."

**Dr. Earl L. Butz** says let us thank God for surplus, even though production is now some 4 to 6% above effective demand for farm products. And thank science for its developments which let farm people get richer, if they can adjust to agribusiness.

The family farm is not going away, he believes. It is just sitting there, not moving forward, while the better managers widen the gap between the good managers and the bad. Science has made it possible for one farmer to feed 27 other workers, where once it took a farmer's full time to feed 4. So living standards have climbed for us all, except the poor managers.

This may not be social justice . . . but it is the way the economy works.

Meanwhile let it be clear that food prices are not high. Relative to income, or hours of work to buy a loaf of bread, they are low. This is something Khrushchev wanted to find out about, and why his first visit was to Beltsville, and his longest stop at the Garth farm while he was here. Agriculture is the Achilles heel of the USSR and he needed to know.

So—take three things people think about agriculture and analyze them:

1. **Stop or slow science.** Where would we be today if we had taken that advice in 1940 when it was advanced seriously; even more seriously than it now is?

2. **Equalize income.** We have done some of that, but can it ever be economically, or even socially sound? Abraham Lincoln said once: "You can never strengthen the weak by weakening the strong."

3. **Educate and equalize upward.** Channel the benefits of scientific development to the farm. It is our job to strengthen the weak.

**Donald R. Matthews** reported as a member of the House committee on agriculture, and he says this committee is about as badly divided as the three great farm organizations on the subject of what to do about the farm problem. He traced the history of farm legislation back to 1840 and up to date, with the statement that there is plenty of law on the books, if it could be implemented with stronger controls to match the better price supports.

The farmers do not realize, he says, how much they are really being helped in every segment, and feels that the whole deal could well be put on a commodity-by-commodity basis, instead of an over all basis.

It was Congressman Matthews who pointed up the social problem involved. The drift to cities has created a problem because there are not enough jobs to go around. And on the other hand, we need our farmers. As it stands today the U.S. could feed the world. We can help all the hungry nations, and we do help many. But the cost of this should be charged to the cold war, and not to the farmer.

Finally, he said that a family farm can be as efficient as a corporate farm. Size is not the criterion.

**Director Sutton** was asked to talk about the Georgia extension program, and did. Its aim is to add $400,000,000 a year to the farmer income of the State. It has made good progress in this direction.

For example, the Georgia Soil Fertility program has spread from a few counties to a good number. Under the leadership of the county agents, a majority of the farms in counties under the program follow the management recommendations well. This is a triumph for the educational program that is part of this operation, and has resulted in higher consumption of fertilizer, and a higher net income for the farmers who are following the College advice.

In a selected group of counties, another phase of the program is being handled on a one-commodity basis. Here, also, the farmer who chooses the crop he is best equipped

to handle, and follows advice, shows good gains. The farmers are profiting by the training they get in management and the new sciences that are part of agribusiness.

He expressed his appreciation to NPFI for their fine cooperation with Land-Grant colleges everywhere, and to the industry itself, which has made possible much of the material used in educating these farmers to a better profit.

He closed with a prediction: There will be more changes in agriculture in the next 15 years than in the past 50. Agriculture will grow more specialized, he believes, as farmers learn what they can grow best and how best to grow it.

That seems an excellent hope for the future.

**Dr. Parks,** as we have said, made what is probably a record for brevity in agronomic circles—and one of the most dramatic talks this industry has heard in a long time.

The future of agriculture rests on a broad base of future question marks—which include such things as world events, as well as domestic economic conditions. Disregarding these, the industry must take the responsibility of making sure the farmers make more money. We have a better opportunity to do this than any other factor in agriculture, and we have not been accepting the responsibility as we should.

The farmer needs to be shown that the Land-Grant college recommendations are sound and will be profitable to him. Our responsibility for this is personal, company and for the Nation. If each of us were paid a bonus on the profits of the farmers in our several bailiwicks, the job would be done faster.

The fact is, he contends, that we are paid as the farmers earn, whether we know it or not. But suppose our own industry had a direct, visible over-ride—not on sales but on results; suppose the county agent got a commission; suppose the Land-Grant college budget was geared directly and visibly to the net revenue in its State . . . things might be quite different. We may have embroidered this statement some in reporting it, but that was the basic thought.

You cannot string along with Ralph Waldo Emerson, said Dr. Parks. You can build a better mousetrap all right. The cost must be low and the price right . . . but you need advertising and selling to get it to the people. You cannot sit there, hoping they will beat a path to your door. Emerson was a great writer, but not a very practical economist.

While we are awaiting that path, the farmers are using only half the fertilizer they should. Either they are not getting the story, or they don't believe it.

Why?

Does the dealer have enough margin of profit to devote time to selling? Does he really know the story? Have we taught him? If we give him a better margin, and he can help the farmer to a better use of fertilizer, the farmer will profit even though the price is up.

Does the County Agent get enough so he is inspired to get out and pound home the story? And does he know the whole story?

Are the colleges selling their services and the rightness of their counsel to the farmer? Are they doing enough selling to our industry, so that when budget time comes up we will be in there pitching to the legislature?

Dr. Parks thinks not. And he thinks we must do something about it, now, as individuals, as companies, and as good citizens of the U.S. The farmers' profit is our own insurance for the future!

**Dr. Beacher,** who spearheaded the development of this program, deserves the thanks of the Southeastern portion of the industry for a fine job.

## Featured at Southeastern Conference

*Campbell* *Beacher* *Ballentine*

**THEME: THE FUTURE FOR FARMING AND FERTILIZER**

Presiding ..... W. M. Campbell
Dixie Guano Company, Inc., Laurinburg, N. C.

Welcome ..... Dr. R. L. Beacher
Southern Regional Director, N.P.F.I.

**PANEL: WHAT DOES AGRICULTURE NEED?**

Is it better public relations? ..... L. Y. Ballentine,
Commissioner of Agriculture, North Carolina

Is it greater production efficiency? ..... Dr. Earl Butz, Dean
College of Agriculture, Purdue University

Is it better agricultural legislation? ..... Donald R. Matthews,
Representative Eighth District of Florida

Is it more intensive farmer educational programs? ... Director W. A. Sutton
Ga. Agric. Extension Service

What is industry's responsibility for the future of agriculture? ..... Dr. R. Q. Parks,
General Manager, Nitrogen Products Division, W. R. Grace & Co.

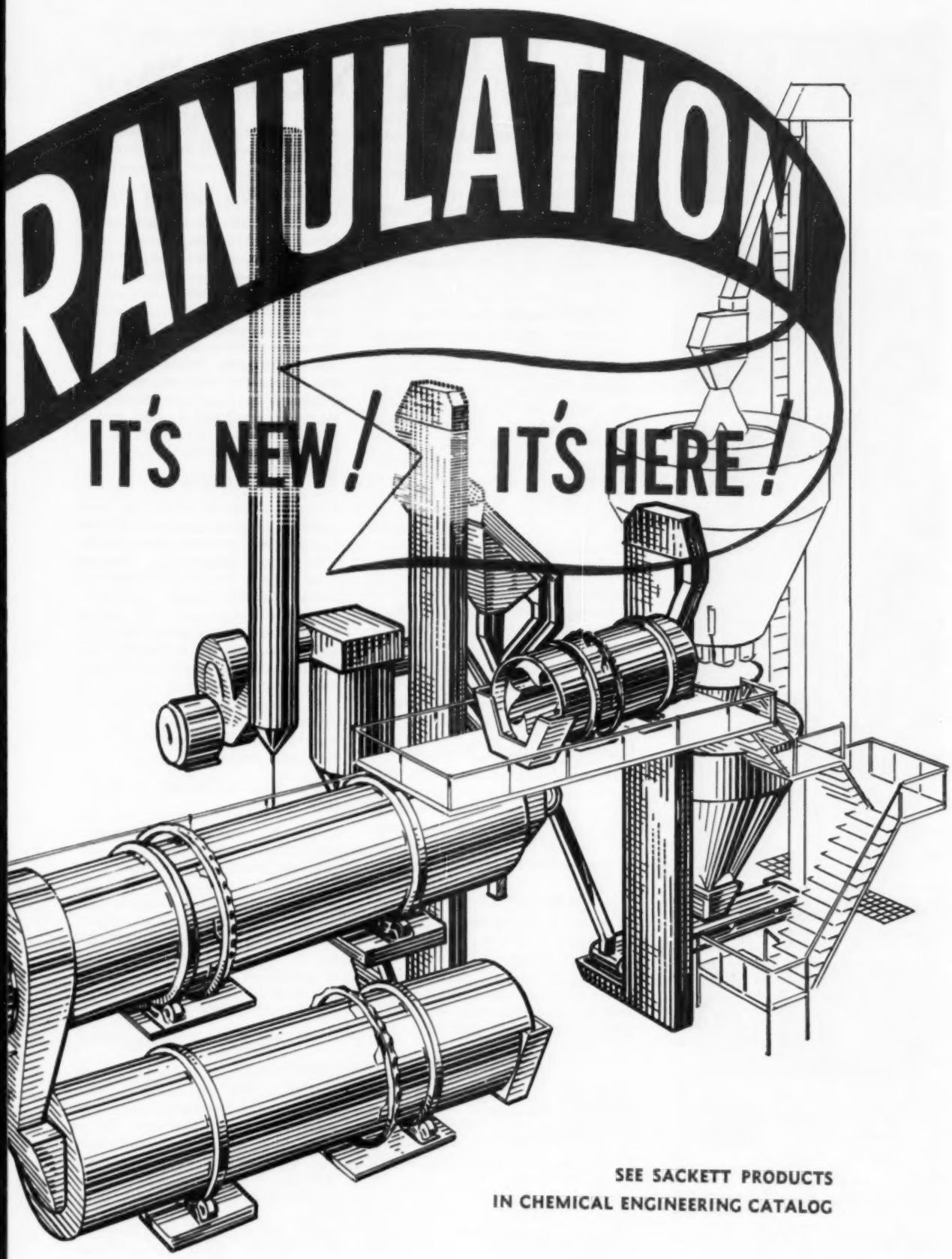
*Butz* *Matthews* *Sutton* *Parks*

# Obituaries

*Mark M. Biddison,* 68, president of the General Chemical division of Allied Chemical Corp. from 1952 to retirement in 1955, died October 16 at Sarasota, Florida.

*Joseph J. Crosby,* 64, president of California Liquid Fertilizer Co., Pasadena, died October 4 of a heart attack, at his home.

*Paul L. Sutton,* 43, manager of Spencer Chemical Company's agricultural technical laboratory, died unexpectedly October 10, at the Tulsa, Oklahoma, airport. Death was attributed to a heart attack.




SEE SACKETT PRODUCTS
IN CHEMICAL ENGINEERING CATALOG

# CHANGES

### IMC Buys Rauh

*IMC-Rauh*: International Minerals & Chemical has contracted to purchase E. Rauh & Sons Fertilizer Co., Indianapolis, which operates granulating plants at Indianapolis and Plymouth, Indiana, and Sylvania, Ohio, and sells in five Midwestern states.

### IMC-Electric Reduction

*IMC-ERC*: International Minerals has signed with Electric Reduction Co., a multi-million dollar deal which involves shipping calcined phosphate rock from Florida to be processed by the Canadian plant building at Port Maitland, and IMC will become U.S. sales agent for the triple superphosphate and phosphatic fertilizer solution which is produced.

### Wilson & Toomer Sold

*Wilson & Toomer*, Jacksonville, Fla., 67-year-old fertilizer concern, with a stable earnings record (1960 is typical at $19,000,000 in sales) has been acquired for $8,500,000 cash by *Plymouth Cordage Co.*, oldest and largest domestic producer of ropes. W&T has two plants in Florida and two in Georgia.

### Southern Nitrogen Buys Outlets

*Southern Nitrogen*, Savannah, Ga., has acquired *Millhaven Sales Corp.* which operates anhydrous ammonia distribution facilities in southeastern Georgia. The transaction is said to involve some $500,000.

### Naturizer-Lockheed

*Naturizer, Inc.*, Norman, Oklahoma, developers of a process to convert municipal refuse into garden compost, has completed a deal with the California plant of *Lockheed Aircraft* to manufacture and sell worldwide the Naturizer process.

### Cyanamid

*Cyanamid*: American Cyanamid Company has started building a $15,000,000 home at Pine Lakes, N. J. and will gradually relinquish its present quarters at 20 Rockefeller Plaza, New York City.

### Terre Co.

*The Terre Co.* on or about November 15 will be located in expanded headquarters at Totowa, N. J., corner of Route 46 and Union Bldg. The mail address will be Paterson 2, N. J.

### Co-op Buys Meridian Plant

As the result of the sale of the Meridian Fertilizer Factory plant and property at Hattiesburg, Mississippi, to Mississippi Federated Cooperative, headquarters at Jackson, who operate superphosphate and granulating plants at Canton, Meridian and New Albany, the Meridian Fertilizer Factory, a Southern Cotton Oil affiliate, will be liquidated. It is equipped to produce superphosphate and includes an ammoniating plant for 50,000 annual tons of mixed goods.

### Girdler

*Girdler Corporation* is the new name of Girdler Construction Corporation of Louisville, Ky., Girdler is in the fertilizer field as designer and builder of plants for the removal of carbon dioxide and hydrogen sulfide from natural gas, for the production of hydrogen, nitric acid, ammonia, ammonium nitrate and other chemicals. They are also exclusive agents in North America for the Meissner continuous nitration process. Girdler is a subsidiary of The Chemical and Industrial Corp., Cincinnati.

### USI Buys Minnesota Outlets

*U.S. Industrial Chemicals* has purchased *Minnesota Liquid Fertilizer Co.*, Minneapolis, a Minnesota pioneer in distribution of anhydrous ammonia, established in 1952. 32 of the 40 MLF plants went to USI; the other 8 remain in the realm of B. W. Smith, president of MLF, going to Agro-Vita, with which he is associated. The deal will supply USI with outlet in Minnesota for its big Tuscola plant.

### Calspray Now Ortho

*Ortho Division of California Chemical Co.* is the new name of California Spray-Chemical Corp. The parent company, Standard Oil, is expanding further into chemicals, and consolidating all this activity into this one subsidiary, CCC. The division will continue under H. J. Grady, in their management for 34 years, and president since February of this year. Personnel and marketing will continue as in the past.

*"Sell happy gardens" told to*

# Northeastern Conference

"Don't sell fertilizer, sell happy gardens," was the admonition of *Dr. Hector Lazo,* Professor of Marketing, Graduate School of Business Administration, New York University, at the Northeastern Fertilizer Conference, sponsored by the National Plant Food Institute, at the Hotel Hershey, Pennsylvania.

"Manufacturers today no longer sell products, they sell customer satisfaction," he said. "This is part of the new marketing orientation and the successful manufacturers of the 1960s are those who adopt this new philosophy, research the customer wants, and gear their production and distribution practices to satisfy those wants."

Dr. Lazo set the stage for his proposal by outlining the experiences of other industries in adopting the "new marketing concept." In many fields, both consumer and industrial, wide-awake manufacturers have adopted the new philosophy, and have taken advantage of a vastly expanded consumer purchasing power.

"The danger signals are up in your industry," said Dr. Lazo. "You appear to have reached a sales plateau which indicates you may be just about holding your own. But at least two new markets beckon the unafraid, and those who dare to go after these markets will find most rewarding profits awaiting them. In the chemical industry particularly, too many companies have given lip service to the new marketing needs of America and of the world, but have done little else. A mere handful of companies have reorganized for the new marketing. Those will be the outstanding leaders of tomorrow, for the laggards will not be able to meet competition. These leaders have put aside the management thinking focused on production and are turning to marketing as the customer-making side of the economic coin. They have discovered new markets, new potentials, and what is perhaps even more important, have discovered ways and means of developing profitable sales."

The 1950s saw a great stride in American industry in the direction of customer-oriented business, Lazo said, and those who have their reorganization pains behind them will start reaping the benefits early in the 1960s. He urged his listeners to discard the "production philosophy which served us well as long as we were, like the rest of the world, a nation of scarcities. But, today, we must learn to successfully market our surpluses." He reminded the industry that in the plant food industry alone, there is, at present, a 25 per cent over-capacity because the new and potentially large markets have not been developed.

**SEPTEMBER 29**

Registration
Welcome ---------- W. H. Garman, NPFI Regional Director

**NON-FARM FERTILIZER MARKET**

Presiding Officer ---- H. J. Stangel, Chairman, Highway and Turf Fertilization Task Force, Northeastern Research and Education Committee
"What is the Market Potential" ---------- C. R. Skogley, Turf Specialist, University of Rhode Island

**FERTILIZER PRACTICES IN THE NORTHEAST**

"Intensively Used Turf" ---------- J. C. Harper, Turf Specialist, The Pennsylvania State University
"Less Intensively Used Turf" ---------- Joseph Troll, Turf Specialist, University of Massachusetts

**HIGHWAY FERTILIZATION IN THE NORTHEAST**

"Establishment of Roadside Turf" ---------- H. H. Iurka, Landscape Architect, New York Dept. of Public Works
"Maintenance of Roadside Turf" ---------- E. F. Button, Agronomist, Connecticut State Highway Department

**SALES PROMOTION, ADVERTISING**

"The Agronomic Approach to Sound Advertising" ---- C. F. Winchell, Agronomist, Consolidated Rendering Co.
"Merchandising Techniques for the Non-Farm Market" -- A. E. Buter, Assistant to the Manager, Fertilizer Manufacturing, Nitrogen Division, Allied Chemical Corp.

**SEPTEMBER 30**
**CHALLENGE OF THE NEXT TEN YEARS**

Presiding Officer ---------- W. H. Garman
"What Makes a Star Salesman a Star" ---------- H. B. "Doc" Sharer, Sales Training Specialist, U. S. Rubber Company
"A Coordinated Marketing Program for the Plant Food Industry" ---- Hector Lazo, Professor of Marketing, Graduate School of Business Administration, New York University

Question and Answer Period

## Attendance increased at

# Control Officials' Meeting

Stepped up attendance at the American Fertilizer Control Officials meeting at the Shoreham October 13-14 in Washington, D. C. brought the total to 165 which included 60 fertilizer industry members, 84 control officials, 14 U.S.D.A. representatives, 2 NPFI staff members, and 5 members of the press. Last year the total registration was 145.

Those attending the meeting were guests at dinner Thursday evening of the National Plant Food Institute with President Paul T. Truit as host. Immediately following dinner NBC commentator Peter Harkness talked briefly about the presidential candidates as a prelude to the Kennedy-Nixon debate which was broadcast that evening. Four TV sets had been brought up in the dining room so every one could see and hear. At conclusion of the debate everyone adjourned to attend the evening meeting of the states relations committee.

At the meeting three subjects evoked positive response from industry members. In discussion on the question "Should pictures and promotional or sales material be included on specialty labels? If so, to what degree? Also should the fertilizer grade always appear with the brand name?" It was brought out that the buyer of such goods, usually a housewife, was not interested in grade information or understood it, and her purchase of the product depended on pictures and the selling message. Also with respect to uniform labeling it was stated that this would be desirable a point definitely corroborated by R. L. Jones of Armour Agricultural Chemical Co.

On this question "How about requiring bulk delivery and/or spreader trucks to carry sample containers (suitable for mailing) and educate the farmer to take his own informational sample from each load for sending to the state laboratory?" Royster's Sam Thornton said, "Emphatically no."

Replying to the third question "When a dealer in liquid or bulk dry fertilizers purchases a particular grade from more than one manufacturer and places all the material in one tank or storage bin, who shall be responsible for the tank or bin contents in the event of a discovered deficiency?", M. B. Rowe of Virginia said that in his State under these circumstances the dealer becomes a formulator or manufacturer and is held responsible.

Friday was a full day of meeting. President *Stacy B. Randle, New Brunswick, N. J.*, in his address touched briefly on the changes and problems confronting the industry and the work of the control official. Areas for increased study and service are in bulk shipments and custom blends on farms, he said, also in increased non-farm fertilizer use where the home-owners' ignorance is easy prey for any product sold under the name of fertilizer ranging from the good to the almost worthless. He listed this as an area where both state officials and the fertilizer industry have a golden opportunity to perform a real service. Otherwise there could be legislation to control bad practices (unless they can be corrected on a voluntary basis).

*Charles E. Kellogg, Assistant Administrator for Soil Survey, Soil Conservation Service, U. S. D. A., Washington, D. C.*, presented aspects of the world picture in agriculture and fertilizer's place in it. The efficiency of our farms is not due to any one factor but to four factors either natural or added: (1) proper balance of nutrients (2) water and an in root zone (3) the genetic ability of the plant itself (4) the protection factor (from disease, insects, etc.). Vast areas of the world could be made to produce anywhere there is abundant water and freedom from frost. He expressed belief that the "have-not" countries would do far better to give more attention to agriculture and its development rather than invest in steel mills and other in-

**Left:** Incoming Control Officials' President Charles Marshall (left) of Canada admires plaque presented to retiring President Stacy Randle of New Jersey.
**Right:** New AAFCO officers are (left to right) President Charles Marshall of Ottawa, Ontario, Canada; perennial Secretary-Treasurer Bruce Cloaninger of Clemson, S. C.; and Vice President John Kuzmeski of Amherst, Mass.
(Commercial Fertilizer staff photographs)

**Left:** Bert Tucker, Sohio Chemical Co., Lima, O., and Aaron Baxter, Olin Mathieson Chemical Corp., Greenville, N. C.
**Center:** William Duncan, U. of Ky., Lexington; Ralph Wehunt, TVA, Knoxville, Tenn.; and R. C. Crooks, Fla. Dept. of Agriculture, Tallahassee.
Right: A. L. Mehring, USDA, Beltsville, Md., and Maurice B. Rowe, Virginia Dept. of Agriculture, Richmond.
(Commercial Fertilizer staff photographs)

## —ANNOUNCEMENT—

Official Publication No. 14 issued by the ASSOCIATION OF AMERICAN FERTILIZER CONTROL OFFICIALS will be available for distribution at $2.00 per copy (discounts in lots of 100 or more) November 15, 1960, through the office of the Secretary-Treasurer, B. D. Cloaninger, P. O. Drawer 392, Clemson, South Carolina.

The publication includes official definitions of all fertilizer terms, grouped by principal plant food ingredients; names, addresses and telephone numbers of all Fertilizer Control Officials; and, complete papers of all those who appeared on the annual convention program.

Send check or money order to the Secretary-Treasurer, P. O. Drawer 392, Clemson, South Carolina, with complete mailing instructions. Money will be promptly refunded if not satisfied with the publication.

dustrial projects. Money invested in fertilizers, machines, etc., for growing crops can be just as important in building the economy of a country as investments in steel mills. To speak of fertilizer "conservation" is misleading—its use is more nearly an investment.

*Rodger C. Smith, Eastern States Farmers Exchange, Inc., West Springfield, Mass.* said that fertilizer technology is meeting the challenge of a changing agriculture; ingredients being made available by the chemical industry for mixing or direct application are substantially improved. New developments are ahead. With more production on fewer farms with less labor, the farmer wants and needs fertilizers that more adequately meet the nutritional needs of his crops, that reduce his labor, particularly at peak work periods, and that continue to offer opportunity for high return on investment.

*Ralph L. Wehunt, TVA, Knoxville, Tenn.*, firm believer in soil testing and what it can do for the farming community, has seen its contribution to intelligent use of fertilizer and the soil testing farmer become a better customer for the fertilizer industry. He also thinks that much of the educational material directed to the farmer has been wasted because it is not simple enough and the farmer did not understand it, so did not take advantage of it. But well-planned educational programs are getting across the message on how to take soil samples, what the analysis means and how to interpret the recommendations, and soil-testing is fast gaining ground in most areas of the country. It is teaching the farmer the difference between proper use of fertilizer and ineffective use—in terms of making it possible to buy that new refrigerator or sending a son to college.

*A. L. Mehring, U.S.D.A., Beltsville, Md.*, discussed some interesting figures on the increase of nonfarm use of fertilizers, gave 2,000,000 tons as the yearly tonnage, one half of which is used by the householder, the other million tons divided in use and in declining order by: golf courses, airports, athletic fields, industrial plants, and city parks. Of the entire total ⅔ is applied to grass. Average usage at private homes varies from 25 lbs in Iowa to 149 in Florida for the 38 states surveyed. The breakdown by regions he gave as follows: New England, 54,000 tons; Mid-Atlantic, 219,000 tons; South Atlantic, 218,000 tons; E. N. Central, 179,000 tons; W. N. Central, 59,000 tons; total 729,000 tons.

*Walter D. Scholl, U.S.D.A., Beltsville*, discussed some of the figures in his report of survey on bulk fertilizer distribution which will be shown in full in AAFCO's publication of the proceedings of this meeting.

*William Duncan*, University of Kentucky, Lexington, explained in detail the numerical characterization of fertilizer company records. Through computer tabulation of grade and sample numbers and their N-P-K analyses, average analysis and coefficient of variation figures are obtained. Compilation of these figures to get summaries can show a company's per cent of grand average of percentage guarantee and grand coverage of coefficient of variation, and give meaningful and useful information to the fertilizer manufacturer. The manufacturer can find out how his records stand; the buyer can find out the manufacturer that will give him the most for his money.

*Richard C. Crooks, Department of Agriculture, Tallahassee, Florida*, presented tabulation sheets and chemical producers on water-soluble manganese in mixed fertilizer, a Florida research project. *B. D. Cloaninger, Clemson, S. C.*, reported on the use of I.B.M. equipment among fertilizer manufacturers and fertilizer control officials. M. B. Rowe, Richmond, gave a summary of tonnage data, semi-annual basis. And the program was concluded following reports of investigators.

*OFFICERS AND EXECUTIVE COMMITTEE*

*President*—CHARLES MARSHALL, *Ottawa, Canada*

*Vice President*—JOHN KUZMESKI, *Amherst, Mass.*

*Secretary-Treasurer*—BRUCE D. CLOANINGER, *Clemson, S. C.*

*Executive committee terms expiring:*

*1961—Robert Guntert, Topeka, Kansas*

*1961—R. C. Wetherell, Bozeman, Montana*

*1963—H. J. Fisher, New Haven, Conn.*

*1963—W. L. Baker, Columbia, Mo.*

## N. C. Resumes Beaufort Phosphate Tests

Once again North Carolina is making an effort to bring up phosphate from the Beaufort area, efforts which were abandoned in 1958. The companies that tried it could find no economically sound way to mine the mineral which exists in a 30 to 40 foot vein covering some 450 square miles. The present effort uses water, forced down a shaft, expected to force the phosphate up another adjacent shaft.

## W. Va. P&P Introduces Creative Design Service

A new creative design service offered to customers by West Virginia Pulp and Paper Company makes it possible for multiwall bag users to achieve advertising impact for their products as outstanding as that of any product on today's supermarket shelves.

The creative service offered by the multiwall bag division provides a fresh, original approach to printing, color and layout, which is translated into a series of preliminary and finished designs—all without cost to the customer. The service will create entirely new designs or revise and modernize existing designs.

Victor S. (Mike) Luke, manager of the multiwall bag division said Bradbury Thompson of Riverside, Conn., one of the nation's leading art directors and designers, had been retained by the company as design consultant to insure the most advanced concepts in typography, color and layout for multiwall customers.

# Crop Chemicals

*news from the pesticides industry*

*Hormones* from plants, which supply greater control over blossoming a timing of fruit production, have been reported by University of Wisconsin's R. H. Roberts.

*Olin Mathieson* is testing urea with DDT in water, the mix sprayed on cotton.

*Authorized*: Limited fall application to Virginia alfalfa of granulated heptachlor and its fertilizer mixtures.

*Tobacco mosaic* responds only to the milk treatment according to the N. C. A.E.S. They just tell us it's so! nobody knows why!

*Inoculation* of plants with a disease virus can enable them to develop resistance against that disease, as humans react to vaccination, say Cornell's A. F. Ross and Robert F. Bozarth. It works on tobacco mosaic, by the way—they tell us!

*Grain rust* control is closer with the finding, by University of Minnesota plant physiologists, of a practical way to measure the effective life of chemicals used for systemic rust control.

*Fungus* diseases may be wiped out by "Pisatin," a report says from the Australian Division of Plant Industry, where Dr. D. R. Perrin and Dr. W. Bottomley have isolated this substance, which is produced by plants. With the chemistry of this substance known, it may be possible now to reproduce it chemically and use as a spray to protect from plant diseases.

*"Faith in AG Chemicals must be restored"*—The public must be reassured of the importance and safety of agricultural chemicals lest current concern of their use stifle research vital to the nation's agricultural progress, members of the National Agricultural Chemicals Association were told at the organization's 27th annual meeting. He urged the industry to step up its discussion of the benefits and proper use of agricultural chemicals before civic groups and through public symposia.

Announcement of the election results was made by NAC executive secretary L. S. Hitchner who stated that *Tom K. Smith, Jr., vice president, Monsanto Chemical Company, general manager, Agricultural Chemicals Division*, St. Louis, Missouri; *W. F. Price, general manager, Agricultural Chemicals division, Swift and Company*, Chicago, Illinois; and *M. C. Van Horn, vice president, Wilson and Toomer Fertilizer Company and general manager, Florida Agricultural Supply Company division*, Jacksonville, Florida, had been elected to serve on the board of directors of the NACA for a three year term.

*Southern Weed Conference* — The latest developments in the use of herbicides to control weeds in all phases of Southern agriculture will be presented and reviewed during the fourteenth annual Southern Weed Conference scheduled to be held in St. Petersburg, Fla., Jan. 18-20, 1961.

Officers for the Conference are: President, Dr. R. A. Darrow; vice-president, Dr. Walter K. Porter, Louisiana State University, Baton Rouge, La.; secretary-treasurer, Dr. R. E. Frans, University of Arkansas, Fayetteville, Ark.

All sessions of the conference will be held at the Hotel Soreno, St. Petersburg. Conferees are expected to make their own hotel accommodations.

## Anodic Protection Against Corrosion

"Tremendous use" of anodic protection to prevent corrosion in chemical process plants in the future was described "as a method of achieving passivity" of metals by electrochemical means. It is the seventh and newest means for reducing corrosion. The other six are: selection of more corrosive-resistant materials, coating, inhibitors, nonmetallics, design and cathodic protection, according to Carl E. Lock, Merle Hutchison and Norman L. Conger, of Continental Oil Company, Ponca City, Okla., authors of a paper, Anodic Protection Against Sulfuric Acid Corrosion, presented during the 43rd National Meeting of the American Institute of Chemical Engineers.

The more exotic metals, tantalum, columbium, titanium and zirconium, which heretofore had limited use or were "little more than laboratory curiosities," have within the last 10 years become available in increasing quantities at reduced prices, which "makes them attractive for corrosion resistant applications in the chemical industry."

This was the gist of a paper presented at the corrosion symposium by F. Fink, of the Battelle Memorial Institute, Columbus, O.

These metals have "outstanding resistance to a wide variety of media (and) can be both useful and economical in existing chemical processes," he said. While they are not a "cure-all" for all corrosion difficulties, they are becoming the preferred materials of construction for certain critical equipment components where shut-downs are frequent, loss of production is excessive and where maintenance costs are high."

# useful publications

*Ammonium Nitrate Handling* is the subject of a new 24 page booklet compiled by the Manufacturing Chemists Association. It gives recommended procedures for proper packaging, handling, transport and storage of the fertilizer grade. It is available at the MCA Washington office for 50¢ a copy.

*Food for Future* McGraw Hill, $3.95, 192 pages consisting of discussions by twelve outstanding authorities on the U.S. ability to feed its multiplying millions. Title: Food for America's Future.

*New Mexico*: NPFI has just published a leaflet on good practice in New Mexico and the results to be expected. New Mexico State compiled the facts. At $4 per hundred, the leaflet is available to Institute members with a 15¢ poster with a "take one" box.

*Winter driving safety* for passenger car and truck drivers is the subject of two new booklets issued by the National Safety Council. The data was compiled from driving tests. You can get a sample copy from the Council, 425 N. Michigan Ave., Chicago 11, Ill.

*Safety course* for foremen on a study-by-mail basis. For details ask Len Smith, National Safety Council.

*Effect on soils of long continued use of Sulfate of Ammonia and Nitrate of Soda with and without Lime* is the long title of a short booklet by the Rhode Island AES at Kingston. It was written by Wei-Ming Leo, T. E. Odland and R. S. Bell.

*big success*

# Fertilizer Safety Conference

Fertilizer industry members who had the opportunity to attend the industry's own safety section meeting at the big National Safety Council's annual conference in Chicago heard some very fine talks by experts in key areas of the safety field. The meeting was held at the Hotel Morrison October 17 and 18.

General Chairman *Elmer C. Perrine*, Allied Chemicals Corp., opened the Monday session with a welcome to the group and a brief resume of the group's activities and progress over the past year. Before introducing the first speaker he expressed his thanks for the fine cooperation he had received as general chairman.

*Harry A. Veditz*, Maryland Casualty Co., Baltimore, presented an unusual and extremely valuable talk on mouth to mouth resuscitation. When a person has suspended breathing from drowning, electric shock, gases or fumes, etc., usually the lips and base of the finger nails are blue. This is when every second counts and instant on-the-spot artificial respiration is needed. Older methods long in use are valuable said Mr. Veditz, but cannot compare with the mouth to mouth method in speeding effective recovery. There are only a few simple steps to follow but they must be followed precisely and with care. Mr. Veditz gave a complete demonstration detailing each move and showed color slides of pictures he had made during some tests on a live subject. These were part of research work being done on this at one of Baltimore's big hospitals. He also showed a color film made at this hospital, which showed an outline of the work and a step-by-step demonstration of the mouth to mouth method; another film graphically showed some of the case histories that daily make the headlines wherein mouth to mouth resuscitation can mean the difference between life or death. Considerable discussion followed this talk and many questions were asked.

The last half of the afternoon session consisted of a panel discussion on disabling injuries. Participants included Mike Ellison, protection supervisor, Mississippi Chemical Corp., Yazoo City, Miss.; E. J. Emond, director automobile safety, Armour & Co., Chicago, Ill.; R. L. Freemon, supervisor, Safety and Services Dept., Butler Chemical Co., Galena Park, Texas; Norman F. Maddux, plant manager, Florida Nitrogen Co., Tampa, Fla.

*Mike Ellison* emphasized the value of persuading employees to return to work the next day after an inconsequentional injury. He said they usually did not realize the jump in loss time accident rating caused by one or two day lay offs—more often than not, they just figure they had not been off in a long time and they might as well take a day or two off.

*E. J. Emond* stressed the increasing responsibility in auto and truck operations and singled out two factors as being high on the list in contributing to accidents. Slides were shown on one case that incorporated both of these factors—poor visibility, due to the ineffective windshield wipers (with which most cars are equipped), and being a good samaritan. In this case poor visibility during a light rain resulted in the salesman's car leaving the road, hitting a pole, breaking one end of the guy wire supporting it and part of it laying it down over

**1.** Paul T. Truitt (right), president of National Plant Food Institute, was honored with presentation of "Letter of Commendation" for emphasis on the need for accident prevention in the fertilizer industry; award was presented by Marshall Petersen (left), National Safety Council engineer assigned to the Fertilizer Section.
**2.** Zenas Beers, NPFI's Midwest Regional Director, Chicago, and incoming safety section General Chairman Ansel Raney of Phillips Chemical Co., Bartlesville, Okla.
**3.** Mike Ellison, Mississippi Chemical Corp., Yazoo City; E. J. Edmond, Armour & Co., Chicago; and Emerson Jones, Allied Chemical Corp., Indianapolis.
**4.** Larry Shopen, Consumers Cooperative Assn., Kansas City, and Jack Annas, International Minerals & Chemical Corp.
**5.** Jim Smith, Western Phosphates, Salt Lake City; Quentin Lee, Cotton Producers Assn., Atlanta; and Curtis Cox, Virginia-Carolina Chemical Corp., Richmond.
**6.** Carl Alkire, Davison Chemical Division, New Albany, Ind.; Marshall Petersen, National Safety Council, Chicago; and Robert Freeman, Hooker Chemical Corp., Houston.
**7.** Norman Maddux, Florida Nitrogen Co., Tampa, and Grayson Morris, Cooperative Fertilizer Service, Richmond, Va.
**8.** John Mark, Farm Bureau Coop. Assn., Columbus, O.; Stratton McCargo, CLF Cooperative Exchange, Ithaca, N.Y.; and Bill Stone, Wilson & Toomer Fertilizer Co., Jacksonville, Fla.
**9.** A. B. Pettit, W. R. Grace & Co., New York, and Paul Truitt, NPFI, Washington.
**10.** Charles Griffith, Virginia-Carolina Chemical Corp., Cincinnati, and Ed Burroughs, F. S. Royster Guano Co., Norfolk, Va.
**11.** Mike Ellison, Mississippi Chemical Corp., Yazoo City; George Dietz, Fertilizer Manufacturing Coop., Baltimore; and Harry Veditz, Maryland Casualty Co., Baltimore.

*EXECUTIVE COMMITTEE*

*General chairman, A. I. Raney, Phillips Chemical Co.; Vice-chairman and program chairman, Gaither T. Newnam, Smith-Douglass Co.; Secretary, John S. Mark, Farm Bureau Co-op Association; National Plant Food Institute-Laison, Louis Wilson.*

**MEMBERS**

Elmer C. Perrine, Allied Chemical Corp.; Frank A. Gerard, Olin Mathieson Chemical Corp.; W. C. Creel, N. C. Dept. of Labor; Stratton M. McCargo, G.L.F. Soil Building Service; C. S. Griffith, Virginia-Carolina Chemical Corp.; F. Wayne High, The Baugh Chemical Co.; E. D. Burroughs, Jr., F. S. Royster Guano Co.; John E. Smith, Spencer Chemical Co.; George F. Dietz, Fertilizer Manufacturing Cooperative, Inc.; A. B. Pettit, W. R. Grace & Co.; C. E. Alkire, W. R. Grace & Co., Davison Chemical Div.; James W. Smith, Western Phosphates, Inc.; Emerson M. Jones, Allied Chemical Corp.; Mike C. Ellison, Mississippi Chemical Co.; Roger Hugg, International Minerals and Chemical Corp.; Quentin S. Lee, The Cotton Producers Assn.; Edward J. Largent, Reynolds Metals, Co.; Grayson B. Morris, Southern States Cooperative; Gordon W. Pittock, William Stone Sons, Ltd.; J. Lauren Shopen, Consumer Co-op Assn.; W. A. Stone, Wilson & Toomer Fertilizer Co.; Jack Annas, International Minerals and Chemical Corp.; Robert Kelley, Swift & Company, Phosphate Center; D. W. Flagler, W. R. Grace & Co.; Yen Shen, Taiwan Fertilizer Co.; Norman Maddux, Florida Nitrogen Co.; Frank Gerard, Olin Mathieson Corp.; Marshall E. Petersen, National Safety Council representative.

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the road. The good samaritan comes along, stops to help and as he steps out of his car and looks toward the wreck a third car approaches, hits the guy wire, pulls it taut up over and across the top of the second car decapitating the man who had just stepped out of it. From this case history, two factors stand out: when you see an accident don't stop to help unless your help is needed; do anything you can to work for the cause of improved visibility. (For complete information write Highway Visibility Bureau, 524 N. Michigan Ave., Chicago, Ill. They have booklets available for something like 6¢ each.)

*R. L. Freemon* said that his company's records showed that whenever they were in the process of negotiating a labor-management contract they had a rash of plant injuries. In fact, their frequency rate was four times the normal rate during this period of unrest. Experience has taught them if they brought the men in and talked to them prior to this time, and the foreman exercised special attention and gave special attention to instruction at such times, that it held down accidents.

*Norman F. Maddux* told of two severe burn cases as result of the men using initiative without sufficient knowledge or understanding of hazards involved. These cases developed just following completion of his company's big nitrogen plant and while a tank car was being unloaded. The pipe line involved was only about three fourths long enough to do the job so a hose connection was used. Before the car was unloaded it was necessary to shut off the flow and it was at this point initiative was used instead of getting proper instructions on handling which resulted in accident.

Tuesday's session began with a group luncheon. *Dr. J. R. Naden*, chief medical officer, Workman's Compensation Board, Vancouver, B. C., Canada, who was after luncheon speaker, offered these pertinent safety guideposts garnered from his observations over the years: (1) Don't put a square peg in a round hole—this is just looking for trouble. (2) Periods of stress and strain can be gotten through safely if safety is a continuing every day program; every body in a company must constantly sell safety and buy safety in order to keep constant consciousness of safety. (3) No time loss accidents are just as important as time loss accidents in determining your safety factor because the serious accident potential is in every accident.

*Dr. George G. Alexander*, Industrial Medicine, Pasadena, Texas, said four points are essential to a small plant medical program; (1) You must have support and endorsement of management (2) There must be interest on the part of your medical personnel. Your contract doctor usually has a better opportunity to work more closely with them than any one else (3) You must have some form of in plant care—either a doctor, or nurse, or even a safety director who has a yen to doctor (this would apply to plants of 300 employees and up) (4) Your safety program must be solely for the benefit of the employee. Or the program will fail. The plant physician must not be dominated by management. He can gain the confidence of employees through help and interest in their personal problems.

*Edward J. Largent*, industrial hygienist, Reynolds Metal Co., Richmond, Va., talked about air pollution; an area in which much work has been done and there is much yet to be done. His findings although not directly pertinent to fertilizer manufacture were highly interesting. He told of work being done for his company and touched on well known air pollution trouble spots in the country such as Los Angeles.

On Wednesday morning the Fertilizer Safety Section's newly elected Executive Committee held its annual meeting before final adjournment.

## "Seeing Is Believing" Agro Forestry Theme

"Fertilizer isn't a thing coming on Christmas trees—it's already here," said Fred Peste at the 3rd Annual Agro Forestry meeting in Shelton, Washington, Sept. 12, 13, and 14. Fred Peste, manager of the Douglas Fir Christmas Tree Co., backed up this statement by taking the visiting agro-foresters out to one of his Christmas tree farms in the area. As they looked out over his acreage of fertilized trees, they could pick out pronounced differences in tree color (dark green) and larger needle size of the fertilized trees. "We have a lot to learn about rates of fertilizers to use, kinds of fertilizers to use, and when to apply them," Mr. Peste stated, but I am very happy with my 1200 acre experimental plot."

He plans eventually on fertilizing a good share of the 20,000 acres which he has under an intensive management program. "Fertilized trees are much heavier, have more foliage and bigger needles, and we need to know how these trees will stand up in shipment in railroad cars into the present markets." Mr. Peste indicated however that the results to date on a limited scale have been quite satisfactory.

Herb Plumb, an active Christmas tree farmer in the Olympia area, echoed Mr. Peste's enthusiasm.

Joe Buhaly, chairman of the pan-

(continued in next column, below)

## Industry Meeting Calendar

| DATE | EVENT | LOCATION | CITY |
|---|---|---|---|
| Nov. 2-4 | Fertilizer Industry 'Round Table' | Mayflower Hotel | Washington, D. C. |
| Nov. 3-4 | Pacific N.W. Plant Food Assn. | Boise | Boise, Idaho |
| Nov. 8-9 | Southwest Regional Safety School | Jung Hotel | New Orleans, La. |
| Nov. 9-11 | National Fertilizer Solutions Assn. | Peabody Hotel | Memphis, Tenn. |
| Nov. 13-15 | California Fertilizer Association | del Coronado Hotel | Coronado, Calif. |
| | 1961 | | |
| Jan. 11-13 | Agricultural Ammonia Institute | Peabody Hotel | Memphis, Tenn. |
| Feb. 16-17 | Midwest Industry-Agronomist Meet | Edgewater Beach Hotel | Chicago, Ill. |
| June 27-29 | Pacific N.W. Fertilizer Conference | Marion Hotel | Salem, Oreg. |
| July 19-21 | Southwest Fertilizer Conference | Galvez Hotel | Galveston, Tex. |



## THE FERTILIZER INDUSTRY ROUND TABLE PROGRAM

**Mayflower Hotel, Washington, D. C. November 2 - 4**

*Wednesday*

10:00 A.M. *Phosphates*
- Phosphate Rock—Availability, Grade & Usage
- Phosphoric Acid—Types, Sources, Characteristics, Usage, Storage & Handling
- Triple Superphosphate Problems
- Ammonium Phosphates
- Economics

*Thursday*

9:00 A.M. *Standardization of Raw Materials*
- Why Uniformity?
- Users' Panel
- Raw Material Producers' Panel

*Communication Problems in Instrumentation* (Panel)
- Case Histories
- New Developments
- Automatic Sampling

*Friday*

9:30 A.M. Business Meeting

10:00 A.M. *Preneutralization* (Panel)

(continued from column at left)

el on Christmas tree management in the Pacific Northwest, emphasized the need for more management research on the 1.8 million acres of Christmas trees in Mason, Kitsap, Pierce, Stevens and Thurston counties.

Loren Curry, Washington State Dept. of Natural Resources, discussed some of the work they were doing on pruning and shearing of trees.

Dr. C. B. Harston of the Washington State University discussed some of the work under way in fertilization of minor forest products.

Dr. Chet Youngberg, forest soils specialist at Oregon State College, said "We are emphasizing the need of building up good nutrient reserves in young trees growing in the nursery."

Larry Fick, Oregon State Board of Forestry, stated that application of 100 lbs nitrogen and 200 lbs phosphate doubled the cone yield over check plots in Douglas fir trees in 1959.

The 3rd annual agro forestry meeting was jointly sponsored by the National Plant Food Institute and the University of Washington in cooperation with the Simpson Timber Co.

## NATIONAL FERTILIZER SOLUTIONS MEETING

Plans are complete for the annual convention of National Fertilizer Solutions Association, which will be held November 9-11 at the Peabody Hotel, Memphis, Tenn.

President Hugh S. Surles, Jr., of Rocky Mount, N. C. is predicting a record turnout for the sessions, which will be highlighted by a group of industry speakers, plus specialists from the outside.

Bob Lemler of Aylco Chemical Corp. will speak on "Selling the Farmer." F. E. Hartzler of Kansas State Teachers College will talk on "Management Practices." A panel of industry men will discuss three topics: "Engineering Developments, Old and New," "Water Soluble Phosphates," and "Ten Years of Liquid Fertilizer." The panel will consist of: Morris Woosley of West Kentucky Liquid Fertilizer Corp.; John Strauss of Ris-Van, Inc.; Dean McHard of Agricultural Business Co.; and Demont Galbraith of Agriform of Northern California.

## Ammonia Use Up 12%, Says Institute Survey

Returns from the annual volume survey conducted by the Agricultural Ammonia Institute indicate a volume increase of 12 per cent for the first seven months of 1960, as compared with the same period last year. Jack F. Criswell, executive vice president of the Institute, said volume increases shown by the surveys always had been on the low side of the actual tonnage.

Returns in the survey came from 78 ammonia distributors in 25 states, said Mr. Criswell. Increases were reported by 42 distributors; 22 showed decreases, and 14 said their tonnage was "about the same" as for 1959.

Mr. Criswell predicted 765,000 tons of ammonia would be shown to have been used as a direct application nitrogen fertilizer during the fertilizer year which ended June 30, 1960. Official estimates from the U. S. Department of Agriculture for that period are not expected for some time yet.

Better weather conditions and the use of more educational meetings for farmers were leading causes for volume gains among the 42 distributors who reported increases. Greater advertising effort and more local test plots also were mentioned, Mr. Criswell said.

Decreases in some cases were blamed on adverse weather during the applicating season, while other distributors mentioned new, competitive ammonia installations in their territories.

# GRANTS

*Texas Research Foundation,* Renner, has a $3,000 grant from IMC for research in 1961 on plant nutrition and soil fertility with special emphasis on potash and magnesium need by pastures. IMC grants total some million dollars.

**SULPHUR INSTITUTE HOSTS**

Representatives of industry and government attended the open house held by The Sulphur Institute. Among those present were (left to right): C. W. Flesher, assistant deputy director for private enterprise, I.C.A.; E. W. Gamble, vice-president, Monsanto Chemical Company; and Wesley Koster, Chemical and Rubber Division, B.D.S.A., U. S. Department of Commerce. K. D. Jacob, USDA and Leonard Gittinger, director of market research, Freeport Sulphur Company are involved in another conversation in the background. The occasion was the official opening of the Institute's headquarters offices at 1725 K Street, Northwest, in the R. C. A. Building, Washington, D. C.

# POTASH USE CLIMBS AGAIN

Deliveries of potash for agricultural purposes in Continental United States, Canada, Cuba, Puerto Rico, and Hawaii by the eight American potash producers and importers totaled 4,285,160 tons of salts containing an equivalent of 2,508,016 tons $K_2O$ during the fertilizer year of July 1959 through 1960, according to the American Potash Institute. This was an increase of nearly 8% in salts and $K_2O$ over the preceding fertilizer year.

Continental United States took 2,335,794 tons $K_2O$; Canada, 109,581 tons; Cuba, 17,964 tons; Puerto Rico, 24,838 tons; and Hawaii, 19,839 tons $K_2O$. These figures include imports of 306,359 tons $K_2O$ for this period, an increase of 21%. Exports to other countries were 381,716 tons $K_2O$, an increase of over 61%. Deliveries of potash for non-agricultural purposes amounted to 154,440 tons $K_2O$, an increase of over 9%, and were 5% of all potash deliveries.

Total deliveries for all purposes were 5,168,550 tons of salts containing an equivalent of 3,044,172 tons $K_2O$, an increase of over 12% in salts and $K_2O$ over the last year.

Illinois with 240,324 tons $K_2O$ was the leading state for deliveries followed in order by Indiana, Georgia, Ohio, Florida, and Virginia. Deliveries do not necessarily correspond to consumption in a given state.

Muriate of potash was the principal grade, comprising over 94% of the total agricultural potash delivered. Of the muriate, standard grade was 1,580,943 tons $K_2O$, while granular muriate was 1,133,888 tons, an increase of 8% in the standard and 18% in the granular grade over the preceding fertilizer year.

Sulphate of potash and sulphate of potash-magnesia accounted for 6% of agricultural deliveries.

Deliveries of potash for agricultural purposes totaled 2,415,982 tons of salts containing an equivalent of 1,416,507 tons $K_2O$ during the first six months of 1960. This was an increase of 14% in salts and $K_2O$ over the same period in 1959. Continental United States took 1,319,905 tons $K_2O$; Canada, 57,289 tons; Cu-

## CF Staff-Tabulated TONNAGE REPORTS

FERTILIZER TONNAGE REPORT (in equivalent short tons) Compiled by Cooperating State Control Officials and Tabulated by COMMERCIAL FERTILIZER Staff

| | September | | August | | April-June Quarter | | January-June | | July-December | | YEAR (July-June) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STATE | 1960 | 1959 | 1960 | 1959 | 1960 | 1959 | 1960 | 1959 | 1959 | 1958 | 1959-60 | 1958-59 |
| Alabama | ------ | 43,284* | 23,789 | 24,068 | 612,918 | 549,564 | 869,240 | 846,309 | 180,959 | 199,250 | 1,050,199 | 1,045,560 |
| Arkansas | 13,380 | 15,112 | 8,666 | 9,071 | 204,314 | 175,590 | 303,835 | 289,363 | 58,713 | 63,767 | 362,548 | 353,130 |
| Georgia | 22,969 | 22,833 | 25,274 | 32,120 | 947,423 | 955,705 | 1,102,220 | 1,130,998 | 299,194 | 294,751 | 1,401,414 | 1,425,749 |
| Kentucky | ------ | 25,432* | ------ | 16,964* | 319,164 | 307,715 | 461,786 | 483,820 | 108,734 | 99,460 | 570,520 | 591,380 |
| Louisiana | 12,999 | 12,878 | 7,120 | 8,426 | 150,438 | 122,382 | 224,087 | 201,642 | 66,744 | 64,152 | 290,821 | 265,794 |
| Mississippi | 43,921 | 34,398 | ------ | ------ | 463,562 | 309,778 | 547,221 | 516,917 | 142,576 | 176,371 | 689,797 | 693,288 |
| Missouri | ------ | 69,282* | 49,891 | 55,435 | 434,606 | 390,699 | 524,336 | 563,055 | 277,708 | 370,036 | 802,044 | 933,090 |
| N. Carolina | ------ | 34,806* | 16,658 | 12,155 | 988,133 | 842,771 | 1,381,263 | 1,468,704 | 175,533 | 228,055 | 1,556,796 | 1,696,759 |
| Oklahoma | ------ | 29,519* | 16,653 | 9,853 | 52,726 | 38,937 | 72,246 | 64,738 | 72,511 | 68,848 | 144,757 | 133,586 |
| S. Carolina | 21,039 | 22,994 | 14,203 | 11,817 | 411,739 | 370,628 | 678,986 | 756,100 | 104,903 | 134,202 | 783,889 | 890,302 |
| Tennessee | 38,701 | 36,721 | 27,253 | 26,551 | 353,905 | 292,705 | 480,429 | 443,602 | 117,275 | 127,116 | 607,727 | 570,718 |
| Texas | 57,509 | 52,426 | 32,845 | 27,081 | 281,701 | 228,767 | 474,627 | 441,851 | 233,410 | 222,800 | 708,037 | 664,651 |
| California | | (reports compiled quarterly) | | | 462,857 | 485,672 | 813,116 | 803,261 | 465,495 | 459,735 | 1,278,611 | 1,262,996 |
| Virginia | | (reports compiled quarterly) | | | 369,502 | 303,300 | 591,113 | 618,965 | 141,177 | 160,178 | 732,290 | 779,143 |
| Indiana | | | (reports compiled semi-annually) | | | | 828,164 | 856,316 | 321,956 | 316,341 | 1,150,120 | 1,172,657 |
| TOTAL | 210,518 | 197,362 | 222,352 | 216,577 | 6,052,988 | 5,374,313 | 9,352,669 | 9,497,038 | 2,766,888 | 2,985,062 | 12,129,570 | 12,478,803 |

------ (not yet reported) * Omitted from column total to allow comparison with same period of current year.

ba, 12,023 tons; Puerto Rico, 16,247 tons; and Hawaii, 11,043 tons $K_2O$. These figures include imports of 150,697 tons $K_2O$ for the first six months of the year, an increase of more than 34% over last year. Exports to other countries were 190,351 tons $K_2O$, an increase of 59%.

During the March-June quarter of 1960, deliveries for agricultural purposes were 845,239 tons $K_2O$ in Continental United States, 39,183 tons in Canada, 10,286 tons in Cuba, 15,525 tons in Puerto Rico, and 6,681 tons in Hawaii making a total of 916,914 tons $K_2O$, an increase of more than 28% over last year. Included in these figures are imports of 150,697 tons $K_2O$ for the first six months of the year. Exports of potash to other countries during the second quarter were 69,111 tons $K_2O$, an increase of 14% over last year.

## NPFI Supplies Radio Transcriptions

Four prominent speakers will be featured in the National Plant Food Institute's twenty-seventh in the recorded Farm Radio News Service series, now being used by 1,250 stations, on request. For further information write to the Director of Information, National Plant Food Institute, 1700 K Street, N. W., Washington 6, D. C.

## Survey Shows Location Governs Patronage

A study made on the business of feed dealers in Kansas shows that location is a major factor—9 times out of ten, according to Richard Herder, Kansas State—in the selection of a dealer. While fertilizer was not studied in this connection, the parallel is obvious.


**'YIELD BARRIER' CONTEST**

Ortho Division (formerly Cal-spray) Break the Yield Barrier Contest has produced some outstanding plots, such as this—where grower Bud Hancock discusses alfalfa yield with Ortho representative Marty Grunnett.

# classified advertising

**RATES:** 50 cents a line for **Situations Wanted** ads; $1.00 a line for **Help Wanted** ads; $2.00 a line for all other classified advertising. Word count runs approximately eight words per line. Copy should be received by 15th of month preceding publication. **Display Classified Advertising** $15.00 an inch; minimum space one inch.

## SITUATIONS WANTED

**SUPERINTENDENT** or Assistant Superintendent. Fifteen years experience in fertilizer plants—seven years as superintendent. Started one of first granulation plants in Midwest. Reply Box 16, % Commercial Fertilizer, 75 Third St., N.W., Atlanta 8, Ga.

**MARKETING SPECIALIST**—Age 32, 11 years experience. Three years with major manufacturer of mixed fertilizers and insecticides. Eight years with major basic producer of agricultural chemicals. All experience in marketing area. Wish to change to expanding firm. Minimum salary $10,000 in eastern location, $12,000 in western area. Graduate of agricultural college. Capable of planning and operating sales training program. Experience in the following product groups: mixed fertilizers, formulated insecticides, phosphate materials, nitrogen materials and technical insecticides. Would be especially useful to firm planning vertical expansion. Reply box 15, % Commercial Fertilizer, 75 Third St. N.W., Atlanta 8, Ga.

## HELP WANTED

**GENERAL MANAGER FERTILIZER DIVISION**—Single plant. Southeast location. Prefer granulation experience. Reply to Box # 14, % Commercial Fertilizer, 75 Third St. N. W., Atlanta 8, Georgia.

**REPRESENTATIVE WANTED** in your territory. From your desk you can earn a substantial addition to your income. Only written contacts with your clients! Write for particulars and further details to VVK-Office, Vienna 66, P.O.B. 128, Austria.

## EQUIPMENT FOR SALE

**FOR SALE:** 20,000 gal., horizontal, aluminum storage tank. Working pressure—60 lbs. Used for Nitrogen Solution storage. Located in Ohio. Box #11, c/o Commercial Fertilizer, 75 Third St. N. W., Atlanta 8, Ga.

**MACHINERY** for complete mixing and shipping of fertilizers; consisting of ½ ton Sackett gravity mixer, scale, elevators and pulverizers. Also, batching and Exact Weight bagging scale. Phone or write, Farmers Fertilizer & Feed Company, Westminster, Maryland.

**SALE OR LEASE**—Chemical Tank Trailers Pressure or non-pressure—304 and 316 stainless and carbon steel tanks. Complete line used—new. Call MAYfair 1-2363. HACKETT TANK COMPANY, INC., 541 S. 10th Street, Kansas City, Kansas.

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**8 — Forster hammermills, size #8, 6**
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**4 — Nordyke 10 x 36 roller mills, 2-roll**
**1 — Stedman 36" dia. 3-row cage mill**
**1 — Jay Bee #4D hammermill, 75 HP**
**4 — Davenport #2A dewatering presses**
**12 — Buflovak 42" x 120" dbl. drum dryers**
**3 — Shriver 48" C. I. filter presses, 50 ch.**
**4 — Wallace & Tiernan bulk flow grain scales, cap. to 1000#/min.**

SEND FOR DETAILED CIRCULAR

**FOR SALE**

**1 — Raymond 66" 6-roll mill, rebuilt.**
**1 — Raymond 50" 3-roller hi-side mill, rebuilt**
**2 — Davenport 8' x 60' rot. dryers, 7/16" welded**
**1 — 7'-6" x 62' rotary cooler, 1/2" welded**
**1 — Louisville 7' x 70' rot. cooler, 1/2" welded**
**2 — Bonnet 7' x 60' rot. dryers, 5/8" shell**
**1 — Allis-Chalmers 7' x 50' rot. dryer, 5/8"**
**2 — Bonnet 6' x 52' rotary dryers, 5/16"**
**2 — 18,000 gal. vert. alum. tanks**
**1 — Sprout-Waldron 336 cu. ft. ribbon mixer**

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